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SELECTED

SESOURCESABSTRACTS



VOLUME 9, NUMBER 3 FEBRUARY 1, 1976 SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior



VOLUME 9, NUMBER 3 FEBRUARY 1, 1976

W76-01001 -- W76-01500

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Research and Technology U.S. Department of the Interior Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

GALERKIN FINITE-ELEMENT SIMULATION OF A GEOTHERMAL RESERVOIR, OF A GEOTHERMAL REDER YOUR, Geological Survey, Reston, Va. J. W. Mercer, Jr., and G. F. Pinder. Geothermics (Italy), Vol 2, Nos 3 and 4, p.81-89, September-December, 1973. 11 fig, 10 ref.

Descriptors: *Geothermal studies, *Thermal water, *Steam, *Mathematical models, *Energy transfer, Porous media, Equations, Fluid mechanics, Thermodynamic behavior, Heat flow,

mechanics, survivalence of the mail systems, Geothermal systems, Geothermal reservoirs.

The equations describing fluid flow and enrgy transport in a porous medium can be used to formulate a mathematical model capable of simulating the transient response of a hot-water geother-mal reservoir. The resulting equations can be solved accurately and efficiently using a numerical scheme which combines the finite element ap-proach with the Galerkin method of approximation. Application of this numerical model to the Wairakei geothermal field demonstrates that hotwater geothermal fields can be simulated using numerical techniques currently available and under development. (Woodard-USGS) W76-01179

IONIZATION OF WATER IN SEAWATER,

Oregon State Univ., Corvallis School of Oceanography

C. H. Culberson, and R. M. Pytkowicz. Available from the National Technical Informa-tion Service, Springfield, Va 22161, as ADA-002 106, \$3.50 in paper copy, \$2.25 in microfiche. Marine Chemistry, Vol 1, p 309-316, 1973. 3 tab, 19 ref. NR 083-102. ONR N00014-67-A-0369-0007.

Descriptors: *Ionization, *Sea water, *Salinity, Descriptors: *Ionization, *Sea water, *Salinity, *Chemical properties, *Hydrogen ion concentration, Ions, Chemical reactions, Saline water, Alkalis(Bases), Temperature, Physical properties, Chemistry, Alkalinity, Hydrolysis, Measurement, Analysis, Laboratory tests.

Identifiers: *Ion product, *Activity coefficients, *Ionic strength, *Hydroxide ion concentration, Malar concentration, Artificial seawater.

Molar concentrations. Artificial seawater.

The ion product of water in seawater and the total activity coefficents of hydroxide and hydrogen ions were determined over the temperature range 2 to 35C and the salinity range 20 to 44 parts per thousand. At 25C and 35 parts per thousand salinity, the measured values were pK(SW)/W=13.20, the activity coefficient of the hydroxide ion equaled 0.22 and the activity coefficient of the hydrogen ion equaled 0.71 the molar concentration scale. (Henley-ISWS)
W76-01239

2. WATER CYCLE

2A. General

SOURCES AND FATE OF 'AVAILABLE' NITROGEN IN RURAL ECOSYSTEMS, Wisconsin Univ., Madison.

For primary bibliographic entry see Field 5B. W76-01031

INFILTRATION MODEL WITH REGARD TO THE SURFACE RUNOFF (EIN INFILTRATION-SMODELL UNTER BERUECKSICHTIGUNG DES LANDOBERFLAECHENABFLUSSES),

Wasserwirtschaft/Wassertechnik, Vol 22, No 12, p 415-419, 1972. 4 fig, 2 tab, 10 ref.

Descriptors: *Model studies, *Surface runoff, Rainfall, Infiltration, Soils, Watersheds(Basins). Identifiers: Surface retention, Horton's diffusion

An infiltration model, based on Horton's diffusion model, has been developed for the determination of runoff in watershed areas. The basic parameters of the computerized model are in principle measurable. As the surface runoff phase as a boundary condition of the infiltration process is considered, event-specific characteristics of the runoff formation are obtained. The initial water content in the ground immediately before rainfall constitutes a determining factor for the relationship of infiltration to surface runoff as it influences the surface retention and the soil infiltration capacities. Watershed areas with fairly homogeneous vegetation are subdivided into wet parts responsible for surface runoff and dry parts with high infiltration capacity for modeling purposes. Applications of this model to areas with abundant precipitation show good agreement with observations. (Sandoski-FIRL) W76-01053

CONCEPTUAL MODEL DESIGN FOR MOTOR-WAY STORMWATER DRAINAGE

C. J. Swinnerton, M. J. Hall, and T. O'Donnell. Civil Engineering and Public Works Review, Vol 68, No 799, p 123, 125-127, 129, February, 1973. 4 fig. 2 tab.

Descriptors: *Model studies, *Drainage, Storm water, Rainfall-runoff relationships, Rainfall in-

tensity, Hydrographs. Identifiers: Highway drainage, Road runoff.

Highway drainage is complicated by the necessity to drain both the pavement and the shoulder in one continuous system. In an attempt to clarify the factors which affect the design of such systems, the Road Research Laboratory began in late 1960 to collect rainfall and runoff data at six sites. Subsequent analysis of some 17 station-years of data under the terms of a research contract between the Road Research Laboratory and the Imperial College of Science and Technology, University of London, has indicated the feasibility of using a conceptual modeling technique for design pur-poses. The conceptual model which forms the basis of the proposed design method consists of a single linear reservoir having two alternate values of its storage parameters, namely k1 for periods of rain and k2 for periods of no rain. Using the total rainfall on only the impervious area as input, the model estimates runoff hydrographs using equations for periods of rain and for periods of no rain. The time interval used in the present study was two minutes and the units of rainfall intensity and rate of runoff were inches per day. The value of kl and k2 to be used for any given site and rainfall distribution may be estimated from the equations. (Sandoski-FIRL) W76-01062

NO-TILLAGE SYSTEM REDUCES EROSION FROM CONTINUOUS CORN WATERSHEDS, Agricultural Research Service, Coshocton, Ohio For primary bibliographic entry see Field 2J. W76-01078

SEDIMENT YIELD FROM SOUTHWEST IDAHO RANGELAND WATERSHEDS, Agricultural Research Service, Boise, Idaho.
Northwest Watershed Research Center.

For primary bibliographic entry see Field 2J. W76-01086

NUTRIENT AND SEDIMENT DISCHARGE FROM AGRICULTURAL WATERSHEDS IN OKLAHOMA,
Agricultural Research Service, Durant, Okla.

Water Quality Management Lab.
A. Olness, S. J. Smith, E. D. Rhoades, and R. G.

Menzel Journal of Environmental Quality, Vol 4, No 3, p 331-336, July - September, 1975. 1 fig, 3 tab, 19 ref.

Descriptors: *Surface runoff, *Sediment yield, Agricultural *Nitrogen, watersheds *Phosphorus, *Ranges, Nutrients, Chemical anal-Watershed management, Cultivated lands, ysis, watershed management, Cunivated tanus, Fertilizers, Oklahoma, Soil erosion, Precipita-tion(Atmospheric), Rainfall-runoff relationships, Runoff, Topsoil, Vegetation effects, Nitrates, Grazing, Range management. Identifiers: Ranageland watersheds.

Seven cropland watersheds and four rangeland watersheds in central Oklahoma were monitored for surface hydrology and discharge of nitrogen, phosphorus, and sediment over a 1 year period in which precipitation and runoff were much above normal. Sediment losses from the continuancy grazed rangeland watersheds ranged from 18 to 23 metric tons/hectare during the study. None of the sediment losses from the other watersheds exceeded 10 metric tons/hectare. Total nutrients discharged in runoff ranged from 2 to 15 kilograms/hectare of N and 1 to 11.5 kilograms/hectare of P. Flow-weighted mean concentrations ranged from 1 to 6 parts per million of total N, 0.2 to 1.9 ppm of nitrate-N, 0.5 to 4.8 ppm of total P, and 0.04 to 0.9 ppm of soluble P. Cropland watersheds had much greater concentrations of soluble phosphorus in runoff than range-land watersheds. Loss of fertilizer N and P did not exceed 5 percent of the most recent applications, even though surface runoff was 4 to 10 times greater than that observed in previous years. Robinett-Arizona) W76-01116

WATER RESOURCE SYSTEMS AND RELA-TIONS.

Clark Univ., Worcester, Mass. Dept. of Environmental Affairs.

H. E. Schwarz. Reviews of Geophysics and Space Physics, Vol 13, No 3, p 468-472, 525-528, July, 1975. 137 ref.

Descriptors: *Water resources, *Groundwater resources, *Water sources, *Synthetic hydrology, Networks, Surface water availability, Hydrologic cycle, Water management(Applied), Water policy, Water quality, Water resources development, Water supply, Water utilization, Surface-groundwater relationships, Surface waters, Hydrology, Groundwater, Mathematical models, Stochastic processes, Systems analysis, Decision making. Identifiers: Stochastic flow models.

Water resources systems analysis has come to mean the use of mathematical programming and simulation techniques in the study of large-scale systems which control the movement of water on nd under the surface of the earth. In addition to the use of these techniques in analyzing and synthesizing physical systems, significant inputs are being made to broaden the analysis to social, economic, and environmental considerations. A review is presented of surface water systems, groundwater systems, water quality systems, stochastic flow models, decision theory, and net-work theory. (Robinett-Arizona) W76-01118

SNOWPACK DYNAMICS IN RELATION TO IN-VENTORY-PREDICTION VARIABLES
ARIZONA MIXED-CONIFER,

Arizona Univ., Tucson. Dept. of Watershed Management. M. A. Warren.

Group 2A-General

Master of Science Thesis, 1974. 77 p. 6 fig, 5 tab, 53 ref, 3 append.

Descriptors: *Snowpacks, *Snowmelt, *Radiation, *Coniferous forests, *Snow management, Arizona, Runoff, Snowfall, Runoff forecasting, Snow surveys, Water sources, Water supply, Snow, Canopy, Interception, Slopes, Cutting management, Water yield, Statistical methods, Regression analysis.

Identifiers: Snow accumulation, Radiation duration

Snowpack measurements were made on 93 plots for 6 different dates during the winter of 1973-1974 to determine the forest-terrain-snow relationships of the mixed conifer forests in Arizona. Using regression techniques, two sets of equations were developed representing the accumulation and melt periods and storage-duration index. During the ac-cumulation period, the 2 most dominant processes were the interception of falling snow by the overhead canopy and the duration of the sun's direct radiation on the plot. During the melt period, the slope and aspect and the duration of the sun's direct beam radiation on the plot were most domi-nant. The presence of timber was involved in 3 of nant. The presence of timber was involved in 3 of the 4 most dominant processes during the entire winter season. Using this information as input, the land manager can develop cutting presecriptions within a multiple-use framework to yield the highest possible runoff. (Robinett-Arizona)

VALIDATION OF SNOWPACK INVENTORY PREDICTION RELATIONSHIPS IN ARIZONA PONDEROSA PINE FORESTS.

Arizona Univ., Tucson. Dept. of Watershed Management. B. W. Welch.

Master of Science Thesis, 1975. 59 p, 11 fig, 16 tab. 31 ref.

Descriptors: *Snowpacks, *Snow management, *Runoff forecasting, *Water equivalent, *Forest watersheds, Arizona, Snow, Snow surveys, Snowmelt, Water yields, Melt water, Melting, Runoff, Local precipitation, Ponderosa pine trees, Mountain forests, Watershed management, On-site in-

Identifiers: Snowpack inventory prediction.

A validation study of snowpack inventory-prediction equations was conducted during 1972-73 in three study sites within the Arizona ponderosa pine forests. The orginial inventory-prediction equations proved inadequate, possibly because the snowpack water equivalent for 1972-73 was fiveto-nine times above normal. New snowpack inventory-prediction equations were then developed. (McLachlan-Arizona) W76-01127

MATHEMATICAL MODELLING OF AQUATIC ECOSYSTEM: I, Wright State Univ., Dayton, Ohio. For primary bibliographic entry see Field 5B. W76-01195

DIMENSIONLESS INLET HYDROGRAPH

Maryland Univ., College Park. Dept. of Civil Engineering.
R. M. Ragan, M. J. Root, and J. F. Miller.

N. M. Kagan, M. J. Kuot, and J. F. Minet. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY9, Proceedings Paper No 11580, p 1185-1195, Sep-tember 1975. 5 fig. 1 tab, 11 ref., 1 append.

Descriptors: *Urban hydrology, *Hydrograph analysis, *Hydrology, *Hydraulics, *Unit hydro-graphs, *Urban runoff, *Simulation analysis, *Mathematical models, Storm runoff, Storm drains, Model studies.

Identifiers: *Inlet hydrographs, *Drainage design, Kinematic wave, Linked system models.

A number of mathematical models used to estimate storm hydrographs in urban areas consider runoff as a deterministic process and link a series of submodels to simulate the behavior of the various components of the runoff cycle. Because of the number of interrelated formulations in these linked system models, a large core computer is generally required for their proper use. A dimensionless inlet hydrograph was presented that can be developed from a complete linked system model and used as a substitute in some planning and design situations. The central objective was to develop a method for estimating the hydrograph entering an inlet or catch basin that would be simple enough to allow hand computations while retaining good agreement with the computer-generated hydrographs obtained with a complete linked system model. (Terstriep-ISWS) W76-01256

RESOURCES OF WATER VOLCANIC ISLANDS, A PILOT PROJECT IN THE CANA-RIES,

Nies, D. Fernandopulle, R. H. Rodriguez, and J. S. Oiza. Nature and Resources, Vol 11, No 1, p 8-12, January-March 1975. 1 fig, 1 tab.

Descriptors: *Water resources, *Islands, *Data collections, *Projects, Groundwater, Water wells, collections, *Projects, Groundwater, Water wells, Aquifers, On-site investigations, On-site data collections, Runoff, Evaporation, Pumping, Infiltration, Water balance, Water supply, Agriculture, Water properties, Surface runoff, Rainfall, Geochemistry, Sounding, Analytical techniques, Groundwater movement, Analysis, Networks, Surveys, Hydrology, Hydrogeology, Model studies, Sampling, Management, Planning. Identifiers: *Canary Islands(Spain), Volcanic islands. Galleries. islands, Galleries.

The project for the Scientific Study of the Water Resources of the Canary Islands, carried out in 1970-1974 by Spain, UNESCO, and the United Nations Development Program, served as a pilot for the planning of water-resource management in islands of volcanic origin. Hydrometeorological and hydrogeological networks furnished data on surface runoff evaporation, water levels in wells, pumping systems, and physico-chemical charac-teristics of the water. Detailed studies were carried out to test the behavior and 'limits' of given parameters by means of infiltration tests using controllable sprinklers, pumping tests, and plot tests to determine consumption in agriculture. Special investigations included electrical and seismic soundings, use of infra-red technique to detect offshore springs, analysis of stable isotopes and tritium in the water, special borings, experimental geochemical study of the water-rock rela-tionship, and simulation of the aquifer by models. The data acquired during the project resulted in a better understanding of water resources available for current and future use and provided a basis for management policies. Emphasis should be placed on the construction of deep wells in the most suita-ble parts of the island, and the drilling of sloping gallery wells or controlled-discharge wells coastal areas. It was demonstrated that it is possible and necessary to treat a whole island as a single hydraulic unit. The importance of vertical secondary fissures to groundwater movement and stratification were brought to light. (Robinson-ISWS) W76-01258

THE IMPORTANCE OF ACCURATE CURVE NUMBERS IN THE ESTIMATION OF STORM RUNOFF

Utah State Univ., Logan. Watershed Science Unit. R. H. Hawkins.

Water Resources Bulletin, Vol 11, No 5, p 887-891, October 1975. 2 fig, 3 ref, 1 append.

Descriptors: *Storm runoff, *Rainfall-runoff relationships, Hydrology, Runoff, Rainfall, Storms. Identifiers: *Curve number, *Error analysis.

Storm runoff as calculated by the runoff curve number method was shown to be of varying sen-sitivity to both input rainfall and curve number. This method was used to estimate rainstorm runoff volume on ungaged small watersheds for noti votume on ungaged small watersneds to specific storms. Using an assumed input error of 10%, a runoff error chart was given. Up to about 9 inches of rainfall, runoff was more sensitive to curve number than to rainfall. An accurate estimate of curve number was clearly the weak input link for the method, and the importance of accurate curve number selection in this range was stressed. This 10% error, however, may arise solely from physical conditions in the watershed. More engineering and research attention should be paid numbers in mind. (Lardner-ISWS)
W76-01305

CLASSIFYING STORM RUNOFF POTENTIAL WITH PASSIVE MICROWAVE MEASURE-MENTS.

Agricultural Research Service, Chickasha, Okla. For primary bibliographic entry see Field 7B. W76-01306

CALIFORNIA HIGH WATER, 1972-1973, California State Dept. of Water Resources, Sacramento. Div. of Resources Development. For primary bibliographic entry see Field 2E. W76-01315

FLOOD OF JUNE 1972 IN THE SOUTHERN PEACE (SMOKY RIVER) BASIN, ALBERTA, Department of the Environment, Calgary (Alberta). Water Resources Branch. For primary bibliographic entry see Field 2E. W76-01316

HYDROGRAPH SYNTHESIS USING MATHE-MATICAL MODELS,

Wollongong Univ. Coll. (Australia). Dept. of Civil Engineering. M. J. Boyd.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers, Australia, Preprints of Papers, p 117-121, May 1975. 3 fig. 7

Descriptors: *Hydrographs, *Mathematical models, Routing, Storm runoff, Unit hydrographs, Watersheds(Basins), Rainfall-runoff relationships.

Four mathematical catchment models are examined with regard to the synthesis of storm runoff hydrographs. All models compare favourably with the unit hydrograph method while considerable improvement is obtained by the more realistic models. Model parameters, derived by fitting hydrographs, are shown to correlate highly with e catchment characteristics. (CSIRO) W76-01418

AN EVALUATION OF THREE RAINFALL-RU-NOFF MODELS,

Monash Univ., Clayton (Australia). Dept. of Civil Engineering.

I. D. Moore, and R. G. Mein.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 122-126, May 1975. 6 tab, 6

*Rainfall-runoff

*Mathematical model-Descriptors: relationships. *Mathematical models, Watersheds(Basins), Computer models, Australia, Testing, Evaluation, Optimization, Model studies.

Three mathematical rainfall-runoff models, the Boughton model (with a modification to include base flow), the Monash model, and the Stanford Watershed model (slightly modified for daily input data) were applied to four catchments in Australia on a daily basis. The procedure used was to fit the model parameters on several years of data and to test the model performance on a different data period. Evaluation of the models is made on results, ease of use, and computational time required. (CSIRO) W76-01419

PROBLEMS IN THE PROGRAMMED OPTIMISATION OF A HYDROLOGICAL CATCHMENT MODEL,

Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Land Use Research

M. J. Goodspeed.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 127-130, May 1975. 2 fig, 1 tab. 13 ref.

*Optimization, off relationships, Model *Demonstration Descriptors: watersheds, *Computer *Rainfall-runoff models. Watersheds(Basins), Small watersheds.

Investigations carried out in a search for the most appropriate method for optimisation of a deter-ministic model to be used in the Australian Representative Basins Programme are outlined. With efficiency of use of computing time as a major objective, a simple model which could simu-late rainfall-runoff behaviour reasonably well was formulated. Trial optimisations were then performed by two methods for a chosen representative basin. In each case the effects of varying the objective function was studied. (CSIRO) W76-01420

SIMULATION OF THE RAINFALL-RUNOFF PROCESS USING A HYSTERETIC INFILTRA-TION-REDISTRIBUTION MODEL,

New South Wales Univ., Kensington (Australia).

School of Civil Engineering. K. K. Watson, and S. J. Lees.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 131-135, May 1975. 6 fig, 11

*Soil profiles, *Rainfall-runoff *Infiltration. Descriptors: relationships, Hysteresis. *Numerical analysis, Soil moisture, storage, Hyetographs, Depression storage, Mathematical models.

The significance of the soil profile and its accompanying water status in deterministic models is discussed in relation to the current use of the soilstore concept. An alternative numerical approach is described in which the movement of water into and through the soil profile (together with the determination of runoff volumes) is continuously monitored during any pattern of rainfall and non-rainfall events. A significant component in the approach is the use of a comprehensive domain-type hysteresis model for the analysis of infiltration-redistribution sequences. The simulation is illustrated by using a rainfall hyetograph of seven hours durat ion (including one non-rainfall period of one hour) as the flux input into a homogeneous profile of a sandy loam of uniform initial water content. The time-dependent relationships of rate of surface flux, depression storage and runoff volume are calculated for the furation of the hyetograph period. Profiles of water content are also presented. (CSIRO)
W76-01421

FLOOD FREQUENCY DISTRIBUTION IN A CATCHMENT SUBJECT TO TWO RAINFALL PRODUCING MECHANISMS,

Queensland Irrigation and Water Supply Commission, Brisbane (Australia). Surface Water Resources Branch. N. M. Ashkanasy, and W. D. Weeks. In: Hydrology Symposium, Armidale, Australia. 1975. The Institution of Engineers Australia, Preprints of Papers, p 153-157, May 1975. 3 fig, 6

*Storm structure, *Statistical Descriptors: methods, *Frequency analysis, *Flood frequency, Storm runoff, Flood peak, Watersheds(Basins), Rainfall-runoff relationships, Peak discharge, Rainfall disposition.

Traditional techniques for determining the statistical distribution in estimation of extreme flood events in an apparently typical catchment are shown to yield contradictory results. The physical significance of this failure is explained. A dual lognormal approach yields a more reasonable esti-mate, but it is suggested that some uncertainty remains. A major conclusion is that at least in certain cases, extreme events belong to a statistical population which is entirely distinct from that of ordinary annual maxima; the existence of this phenomenon can only be detected by a careful consideration of physical processes. (CSIRO) W76-01425

COMPARISON OF SOME CALCULATION METHODS FOR RAINWATER RUNOFF (VERGLEICH EINIGER BERECHNUNG-SMETHODEN VON REGENWASSER-KANALISATIONEN), J. F. Gruhler, and V. Adamik.

Wasserwirtschaft-Wassertechnik, Vol 25, No 7, p 239-242, 1975. 2 fig, 2 tab, 11 ref.

Descriptors: *Mathematical studies, *Storm runoff, *Rainfall-runoff relationships, Sewerage, Sewers, Storage, Forecasting, *Methodology. Rain water,

The Imhoff-Reinhold; Hauff-Vikari-Kehr; Gruhler; and Pecher methods; the hydrographic method developed in the United States; and a method developed in the USSR for the calculation of rainwater runoff are compared. These calculation methods involve widely differing calculation time requirements, and considerably different sewer system investment costs. The time coefficient method developed by Imhoff and Reinhold is applicable to the construction of most new projects. The Hauff-Vikari-Kehr method may be necessary in special cases, such as for large new sewer networks. The resources of existing sewer systems that may have to be enlarged are best investigated by the Gruhler method, with respect to their storage capacities. (Takacs-FIRL) W76-01426

2B. Precipitation

HYDROLOGY OF CATCHMENT BASIN AT SAMARU, NIGERIA: I. SEASONAL FLUCTUATIONS IN THEIGHT OF THE GROUND WATER TABLE. THE Institute for Agricultural Research, Zaria For primary bibliographic entry see Field 2F. W76-01230

RAINDROP-SIZE DISTRIBUTIONS IN THE MELBOURNE AREA,

Bureau of Meteorology, Melbourne (Australia). P. A. Barclay.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 112-116, May 1975. 2 fig, 3

Descriptors: *Raindrops, *Distribution patterns, *Radar, Rainfall intensity, Classification, Size, Measurement, Synoptic analysis, *Australia. Identifiers: Melbourne(Vic). The results of measurements of raindrop distributions in Melbourne, Australia, and the classifica-tion of these distributions to gemonstrate the differences for given rain types and for rain from different synoptic situations is presented. An impor-tant relationship between radar reflectivity factor Z and rainfall rate R, both measured from the drop-size distributions is determined for each classification with a view to subsequent use in radar rainfall measurement. The equipment used to measure raindrop size is briefly outlined. (CSIRO)

A PHOTOGRAPHIC TECHNIQUE FOR MEASUREMENTS OF ATMOSPHERIC PARTICLES IN SITU FROM AIRCRAFT,

National Center for Atmospheric Research, Boulder, Colo.

Journal of Applied Meteorology, Vol 14, No 7, p 1383-1388, October 1975. 5 fig. 4 ref.

Descriptors: *Photography, *Particle *Particle size *Aircraft, *Cameras, Particle shape, Drops(Fluids), Ice, Atmosphere, Storms, Rainfall, Cloud physics, Instrumentation, Equipment, Data processing, Meteorology.
Identifiers: *Atmospheric particles.

In situ photographs were taken of atmoshperic particles with radius 4 micrometer and larger with a special particle camera installed on a research sailplane. Ice particle shapes, sizes and concentra-tions, raindrop sizes and concentrations, and microscopic cloud particle concentrations and size estimates were obtained from the photographs. Liquid particles could be distinguished from ice particles if their radii exceeded about 50 micrometer. (Sims-ISWS) W76-01472

A REEXAMINATION OF THE EQUILIBRIUM CONDITIONS IN THE THEORY OF WATER

DROP NUCLEATION, Mainz Univ. (West Germany). Institut fuer Meteorologie.

F Herbert

Tellus, Vol 27, No 4, p 406-413, 1975. 1 fig, 14 ref.

Descriptors: *Nucleation, *Drops(Fluids), *Aqueous solutions, Water vapor, Evaporation, Condensation, Equilibrium, Cloud physics, Cloud seeding, Weather modification, Precipita-tion(Atmospheric), Meteorology, Thermodynam-

Identifiers: *Equilibrium conditions, Curvature, Kelvin equation.

The thermodynamic equations necessary to describe the conditions for equilibrium between a highly curved surface of a liquid and its vapor were re-examined. The complete equilibrium behavior was reduced to one single differential equation for each component in an arbitrary ccomponent system. It was shown that this gen formulation can be specialized to describe the conditions for equilibrium between water vapor and a pure water drop, the drop carrying an electric charge, containing a water soluble substance, and/or containing a water insoluble nucleus. In the light of the present formulation, some incorrect physical statements of treatments by various authors reported in literature were pointed out. In an added note, the energy of homogeneous water drop formation was discussed and some erroneous conclusions which commonly are drawn in the literature from formulations on the energy of nucleus formation were mentioned. (Sims-ISWS) W76-01478

FREEZING NUCLEATION IN AQUEOUS ELEC-TROLYTES

Wyoming Univ., Laramie. Dept. of Atmospheric Sciences. M. T. Reischel, and G. Vali.

Group 2B-Precipitation

Tellus, Vol 27, No 4, p 414-427, 1975. 9 fig, 4 tab, 31 ref. Bureau of Reclamation, 14-06-D-6801, NWC N000123-72-C-0911.

Descriptors: *Nucleation, *Freezing, *Aqueous solutions, *Electrolytes, Laboratory tests, Silver Salts, Drops(Fluids), Chemistry of precipitation, Precipitation(Atmospheric), Weather modification, Cloud seeding, Chemistry, Meteorology

Experiments were performed to determine the extent to which the nucleating abilities of artificial and natural freezing nuclei are influenced by the presence of salts dissolved in water. Four different nucleants (at fixed concentrations) were tested in combinations with 10-20 soluble salts using the drop freezing technique. Changes in freezing tem peratures were determined for each nucleant-salt combination at salt concentrations of 0, 0.01, 0.1 and 1 molal. Major differences were noted in the responses of the different nucleants and it was concluded that the influence of dissolved salts on heterogeneous freezing nucleation is not due to changes in the bulk water structure, but results from modifications at the nucleant-embryo interface. The measurements indicated that the salt contents of cloud droplets can be expected to alter the ice nucleating activities of suspended particles by as much as plus or minus 4C. (Sims-ISWS) W76-01479

THE LIFE CYCLE OF CALIFORNIA COASTAL FOG ONSHORE,

Calspan Corp., Buffalo, N.Y. C. W. Rogers, E. J. Mack, U. Katz, C. C. Easterbrook, and R. J. Pilie.

Available from the National Technical Information Service, Springfield, Va 22161 as AD-A003 392, \$5.00 in paper copy, \$2.25 in microfiche. Report No CJ-5076-M-3, September 1974. 96 p, 17 fig, 4 tab, 10 ref, 3 append. AFCRL F19628-72-C-

Descriptors: *Fog, *Coasts, *California, Sea breezes, Land breezes, Winds, Temperature, Drops(Fluids), Aerosols, Clouds, Condensation, On-site investigations, Meteorology. Identifiers: *Fog microphysics, Visibility.

The life cycle of California coastal fog was investigated by examining visibility, temperature, and wind data obtained on a 56 m tower in 10 fog occurrences at Vanderberg Air Force Base in July 1972. The Vandenberg radiosonde data showed that fog did not form when the base of the large scale subsidence inversion was located 400 m or more above the earth's surface. Fog formed at the surface as the base of the oceanic stratus cloud lowered in response to net long wave radiational cooling at the cloud top after sunset. With strong onshore gradient winds, fog was a quasi-steady state phenomenon during the period between fog formation in the evening and fog dissipation by evaporation after sunrise. With weak onshore gradient winds (strong sea breeze circulation), an offshore land breeze occurred near midnight and brought visibility improvement produced by heating over the land. The amount of improvement was inversely related to the time after sunset of the onset of the land breeze, and was directly related to the visibility values present prior to the wind shift. The subsequent shift to onshore flow after midnight brought quasi-steady state fog conditions until dissipation occurred after sunrise. Fog microphysics data acquired in the 10 fogs were found to be consistent at the surface with previous observations in coastal fogs occurring both on land and at sea. The measurements showed, further, that drop concentration and liquid water content increased with height while mean droplet size and visibility decreased with height at least to 42 m above the surface. (Sims-ISWS)

2C. Snow, Ice, and Frost

VALIDATION OF SNOWPACK INVENTORY PREDICTION RELATIONSHIPS IN ARIZONA PONDEROSA PINE FORESTS,

Arizona Univ., Tucson. Dept. of Watershed Management. For primary bibliographic entry see Field 2A. W76-01127

GLACIERS.

GLACIERS.

Proceedings of Workshop Seminar, 1970, Van-couver, British Columbia University, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the Interna-tional Hydrological Decade, Ottawa, Ontario (Canada). 61 p, I append. J. Demers, editor. (1970).

Descriptors: *Glaciers, *International hydrological decade, *Conferences, Canada, Programs, Hydrology, Census, Regime, Ice, Glaciology, Climatology, Melting, Cold regions, Climates, Ablation, Physics, Radiation, Temperature, Tracers,

Radioisotopes.
Identifiers: *Canadian National Committee, Ice shelf, Mass balance.

Key problems connected with glacier studies were discussed. The subject areas included the Canadian International Hydrological Decade program, combined balance studies, mass balance measurements, the regime of the Ward Hunt ice shelf and of the ice in the mouth of Nasen Sound, Canadian glacier inventory, hydrology, experimental studies of glacier climatology, melt-climate relationships, the relation between ablation and global radiation, application of ice physics, temperature measurements, and application of isotope techniques. (See W76-01241 thru W76-01252) (Humphreys-ISWS) W76-01240

GLACIER STUDIES IN THE CANADIAN IHD

PROGRAM, Department of Fisheries and Forestry, Ottawa (Ontario). Inland Waters Branch. O. H. Loken.

O. H. Loken. In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 1-4 (1970). 1 tab.

Descriptors: *Glaciers, *International Hydrological Decade, Canada, Programs, Glaciology, Assessments. Evaluation.

A short review of glacier studies included in the Canadian International Hydrological Decade (IHD) program was given. Six guide books prepared as a part of the IHD program were described. Organizational changes in relation to the glacier studies were described. Assessments were made of the ramifications this program has had for glaciological activities in Canada. (See also W76-01240) (Sims-ISWS) W76-01241

BALANCE STUDIES SELECTED GLACIER BASINS IN CANADA,

Department of Fisheries and Forestry, Ottawa (Ontario). Inland Waters Branch.

A. D. Stanley.
In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 5-9 (1970). 1 fig, 2 tab, 21 ref.

Descriptors: *Glaciers, *Hydrology, *Energy budget, *Water balance, Measurement, International Hydrological Decade, Glaciology, Basins, Melting, Ablation, Cold regions, Canada. Identifiers: Mass balance.

The balance measurements being made at six selected glacier basins in western Canada were reviewed. Following an initial program to obtain mass balance measurements at a large number of basins, standard data are being collected each summer at these six glacier basins. Mass balance, water balance, and energy balance measurements are being made. The combined balances program at selected glacier basins has been successful in developing a unified approach to some aspects of the hydrology of alpine areas. (See also W76-01240) (Sims-ISWS)

MASS BALANCE MEASUREMENTS RELATED TO SURFACE GEOMETRY ON PEYTO GLACI-ER, ALBERTA, McGill Univ. Montreal (Quebec). Dept. of Geog-

raphy.

In: Glaciers; Proceedings of Workshop Seminar, 1970. British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 11-20 (1970). 8 fig. 4 ref.

Descriptors: *Glaciers, *Shape, *Snowfall, *Ablation, Melting, Measurement, Topography, Glaciology, Mapping, Cold regions, Canada. Identifiers: Mass balance, Snow accumulation.

Progress on a study of the Peyto Glacier in Alberta, Canada, was reported. The hypothesis that is being tested is that the shape of the surface of the glacier is associated with both the patterns of accumulation and the patterns of melting. Shape or geometry parameters that are likely to be impor-tant are altitude, slope angle, azimuth of slope, and bumpiness of the surface. The most important conclusions reached so far are that accumulation patterns, while differing markedly for individual storms, tend to be similar at the end of each winter. However, gross amounts of accumulation can vary greatly and the overall patterns are not so similar that the pattern for one year will automati-cally be repeated in every detail the next year. (See also W76-01240) (Sims-ISWS) W76-01243

THE REGIME OF THE WARD HUNT ICE SHELF AND OF THE ICE IN THE MOUTH OF NANSEN SOUND, ELLESMERE ISLAND, Defence Research Board, Ottawa (Ontario).

G. Hattersley-Smith.

In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 21-22 (1970). 4 ref.

Descriptors: *Glaciers, *Ice, *Sea ice, Ablation, Regime, Climatology, Melting, Arctic Ocean, Cold regions, Canada. Identifiers: *Ice shelves, Snow accumulation, Ellesmere Island.

The ice about Ward Hunt Island has been ablating at an average rate of only about 60 mm/yr since 1958, and has been accreting at the rate of about 30 mm/yr since 1963. It seems that ice conditions at the north end of Nansen Sound are reverting to what they were in the early part of the century, when travellers reported very old unbroken floes. Present climatic conditions off the north coast of Ellesmere Island allow very thick developments of landfast sea ice to form up to the point where they may be regarded as incipient ice shelves. (See also W76-01240) (Sims-ISWS) W76-01244

THE CANADIAN GLACIER INVENTORY, Department of Fisheries and Forestry, Ottawa (Ontario). Inland Waters Branch.

In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970, Canadian Ontario (Canada), p 23-30 (1970). 5

Descriptors: *Glaciers, *Surveys, *Mapping, *Canada, International Hydrological Decade, Water supply, Data collections, Ice, Water balance, Energy budget, Rocky Mountain region, Cold regions, Glaciology, Census.

In 1968 the Glacier Inventory Section was established within the Glaciology Subdivision and charged with completing the inventory of Canadian glaciers according to the International Commission of Snow and Ice recommendations and with carrying out other related studies. Only the glacier inventory of Axel Heiberg Island is finished and in print. Eleven hundred and twenty-one glaciers were identified covering 11,735 sq km or 31,5% of the total land area. Measurement of 191 glaciers on Vancouver Island has been completed and the final Vancouver Island glacier inventory report is in preparation. All the glaciers on Baffin Island (10,224), Bylot Island (575), and Devon Island (1,411) have been identified and index maps are in preparation or in print. Work maps have been compiled for several areas in the Rocky Moun-This inventory of Canadian glaciers will establish a datum for all glaciers and will permit a more accurate calculation of the magnitude of the water supply potential of these glaciers. (See also W76-01240) (Sims-ISWS) W76-01245

THE HYDROLOGY OF GLACIERS, British Columbia Univ., Vancouver. Dept. of Geology. W. H. Mathews.

In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 31-32 (1970). 7 ref.

Descriptors: *Glaciers, *Lakes, *Hydrology, Ice, Floods, Glaciology, Cold regions, Iced lakes, Canada Identifiers: Ice-dammed lakes.

One of the major problems encountered in the study of the hydrology of glaciers is setting up study of the nydrology of glaciers is setting up models to adequately account for phenomena which, for the most part, can be observed only from the exterior of the glacier or by remote sensing from its surface. The example of the ice-dammed Summit Lake in the Granduc area which periodically drains and floods the Salmon River below the ice dam illustrated this problem. The general behavior of Summit Lake was discussed along with the economic benefits of finding a way to control the flooding produced by such lakes. (See also W76-01240) (Sims-ISWS) W76-01246

HYDROLOGY OF GLACIERIZED BASINS--SUMMARY OF RESEARCH BY GLACIOLOGY

SUBDIVISION,
Department of Fisheries and Forestry, Ottawa (Ontario), Inland Waters Branch.

L. Derikx, and H. Loijens.

In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 33-35 (1970). 4 ref.

Descriptors: *Glaciers, *Hydrology, Instrumenta-Descriptors: "Glaciers, "Flydrology, Instrumentaliton, Measurement, Ablation, Melt water, Streamflow, Headwaters, Melting, Model studies, Cold regions, Glaciology, Runoff, Canada. Identifiers: Snow accumulation. The research being done to study the glacier meit contribution to streamflow in the North Saskatchewan River headwaters and the hydrology of the Peyto Glacier was summarized. Measurements and instrumentation were described.

Models and the analysis procedures were discussed. (See also W76-01240) (Sims-ISWS)

EXPERIMENTAL STUDIES ON GLACIER CLI-MATOLOGY-ESPECIALLY FOR THE MELT-CLIMATE RELATIONSHIPS, McGill Univ., Montreal (Quebec). Arctic

McGill Univ., Montreal Meteorology Research Group. A. Ohmura.

In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 37 (1970).

Descriptors: *Glaciers, *Melting, *Climatology, Mathematical models, Glaciology, Radiation, Heat transfer, Meteorology, Instrumentation, Tundra, Cold regions Identifiers: Mass balance.

The two experimental studies presented are a part of the glacial-meteorological projects currently being carried out by the Axel Heiberg Expedition. The present experiment suggests that for the small- and middle-scale glaciers on Axel Heiberg Island, the tundra surface conditions and also the sea surface conditions will significantly influence the melting process for glaciers. If the thorough process of glacier melt is to be fully grasped, glaciologists must examine not only the glaciers themselves, but the surrounding areas as well. (See also W76-01240) (Sims-ISWS)

THE RELATION BETWEEN ABLATION AND GLOBAL RADIATION OVER PEYTO GLACI-

Toronto Univ., (Ontario). Dept. of Geography. B. Goodison.

In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 39-42 (1970). 2 fig, 4 ref.

Descriptors: *Glaciers, *Ablation, *Radiation, Correlation analysis, Measurement, Ice, Meteorology, Melting, Glaciology, Cold regions, Identifiers: Peyto Glacier.

During the 1969 field season, a micro-meteorological site was established on Peyto Glacier, and continuous measurement of the shortwave components of the radiation balance became an integral part of this project. In particular, one problem to investigate was the relationship between global radiation and surface ablation of the ice. A correlation analysis showed no significant relationship between these two variables. This can be explained because global radiation is only part of the radiation balance (and only a part of one term in the energy balance equation). Even the inclusion of the shadow effect results in a negligible change in the correlations. The present work is an initial study into the distribution of global radiation over Peyto Glacier, and its rela-tionship to ablation. There is a significant difference in the received solar radiation for any area depending upon its slope, azimuth, and perhaps shadow conditions, but these differences alone do not dictate any statistically meaningful relation-ship between the two variables. More information is required about the other radiation and energy balance components, both at a point and in a spa-tial context. (See also W76-01240) (Sims-ISWS)

THE APPLICATION OF ICE PHYSICS TO GLA-CIER STUDIES, Department of Energy, Mines and Resources, Ot-tawa (Qntario). Earth Physics Branch.

In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 43-46 (1970). 21 ref.

Descriptors: *Glaciers, *Physics, *Measurement, Radioactivity, Estimating, Melt water, Tritium, Ablation, Cold regions, Glaciology, Ice, Snow,

Dating.

Identifiers: *Ice thickness, Mass balance, Thermoluminescence, Snow accumulation.

Work in physics can help by suggesting alternative ways of obtaining information, either through providing a new technique or by using results derived from theoretical studies of glacier flow. In some cases, the alternative method may be better than the existing one; in others, it may at least be useful as a check. Several examples were described, including: (1) estimation of ice thickness, (2) estimation of mean annual ablation rate by measurement of emergence velocity, (3) estimation of ice thickness changes from strain rate measurements, (4) simplified mass balance measurements, (5) electrical methods of measuring ice thickness, (6) thermoluminescence, (7) radioactive fallout as a reference horizon for accumulation measurements, (8) measurement of triti-um content to distinguish between meltwater from snow and meltwater from glacier ice, and (9) dat-ing methods. (See also W76-01240) (Sims-ISWS)

TEMPERATURE MEASUREMENTS IN FOX GLACIER, YUKON TERRITORY, British Columbia Univ., Vancouver. Dept. of

Geophysics and Astronomy. G. K. C. Clarke.

In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 47-48 (1970). 3 fig, 1 ref.

Descriptors: *Glaciers, *Temperature, Ice, Measurement, Thermal properties, Glaciology, Cold regions, Canada. Identifiers: Fox Glacier, Yukon Territory.

Fox Glacier lies in the Steele Creek drainage basin in the Icefield Ranges, Yukon Territory. It is a small (4 km long) surging glacier, at present in its quiescent phase. To investigate the thermal regime, thermistor cables were inserted in holes made with electrically-powered thermal drills. All temperatures were below the pressure melting point except in hole 7, at the bottom of which a layer, some 10 m thick, of ice at the pressure melting point was encountered. There were no spots other than the one in the vicinity of hole 7. That the glacier has this peculiar thermal regime must surely be related to its surge behavior. Whether the observed hot spot is the cause of the glacier's surge activity, or a consequence of its most recent surge, is still open to question. (See also W76-01240) (Sims-ISWS) W76-01251

APPLICATION OF ISOTOPE TECHNIQUES TO GLACIER STUDIES, Alberta Univ., Edmonton. Dept. of Physics.

H. R. Krouse.

In: Glaciers; Proceedings of Workshop Seminar, 1970, British Columbia University, Vancouver, British Columbia (Canada), September 24-25, 1970. Canadian National Committee for the International Hydrological Decade, Ottawa, Ontario (Canada), p 49-59 (1970). 9 fig, 23 ref.

Group 2C-Snow, Ice, and Frost

Descriptors: *Glaciers, *Radioisotopes, *Isotope fractionation, *Isotope studies, Flow, Climatology, Glaciology, Paleoclimatology, Precipitation(Atmospheric), Tracers, Ice, Cold regions,

Stable isotope studies show considerable promise for elucidating problems in glaciology. As many factors can alter isotope abundances, it is necessary to effect many measurements in order to obtain unambiguous interpretations. However, information can be obtained which is not available from other techniques. Therefore, the considerable amount of work involved seems justified. (See also W76-01240) (Sims-ISWS) W76-01252

MEANDERING OF SUPRAGLACIAL MELT

STREAMS, Alberta Univ.. Edmonton. Dept. of Civil Engineering.

For primary bibliographic entry see Field 2E. W76-01261

TOWARD NEW MASS AND HEAT BUDGETS FOR THE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanog.

K. Aagaard, and P. Greisman.

Journal of Geophysical Research, Vol 80, No 27, p 3821-3827, 1975. 1 fig. 3 tab, 26 ref. ONR N00014-67-A-0103-0023, N00014-67-A-0103-0021.

Descriptors: *Heat budget, *Arctic Ocean, *Mass, *Advection, Heat flow, Subsurface waters, Ice, Shear, Bathymetry, Water temperature, Current meters. Heat balance.

Identifiers: *Mass budget, West Spitsbergen Current, Eurasian Basin, Baffin Bay, East Greenland Current, Bering Strait, Geographic features, Net heat flux, Water budget, Salt budget.

Recent current measurements were incorporated into new heat and mass budgets for the Arctic Ocean. These budgets demonstrated the demonstrated overwhelming importance of advection by the West Spitsbergen Current, which in 1971-1972 transported 16.3 times 10 to the 9th power kcal/sq cm/s into the Arctic Ocean. Partially on the basis of the heat budget, it was suggested that there was a large heat loss to the atmosphere in the southwestern Eurasian basin, in excess of 20 kcal/sq cm/yr. Annual mean transport in the West Spitsbergen Current could easily have varied by 35% and might have constituted a significant perturbation on the Arctic heat budget. The mass budgets pointed toward the general ineffective-ness of the Arctic Ocean in transforming subsurface water masses, and they also indicated a large shear between the ice and the upper layer of the East Greenland Current. (Roberts-ISWS) W76-01297

MORPHOLOGY OF AN ARCTIC RIVER BAR,

Louisiana State Univ., Baton Rouge. Center for Wetlands Resources; and Louisiana State Univ.,

Baton Rouge. Coastal Studies Inst. L. S. McKenzie, III, and H. J. Walker. Available from the National Technical Informa tion Service, Springfield, Va 22161, as ADA-003 586, \$4.00 in paper copy, \$2.25 in microfiche. Technical Report No 172, November 1974. 32 p, 48 fig, 35 ref. ONR N00014-69-A-0211-0003.

*Arctic, *Alaska, Descriptors: Descriptors: "Arctic, Sand Outs, "Geomorphology, "Alaska, Rivers, Coasts, Glaciology, Ice, Climatology, Erosion, Sedimentation, Cold regions, Land forming, Running waters, Floods, Sedimentology, Alluvium, Alluvial channels, Sediments, Deltas, Permafrost.

Identifiers: "Colville River(Alas).

River bars are a common landscape element in the valleys of the coastal plain of northern Alaska. They are especially numerous in the Coleville River delta, the largest delta north of the Brooks Range. Most river bars in the Arctic are sub-merged for only a short period of time during river breakup, and most of those occurring on the lee side of river channels are bordered by sand dunes. Putu bar, located near the head of the Colville delta, is of this type. Like other river bars, it pos-sesses a number of small forms. The structural and temporal variation of some 18 microrelief features investigated during the 1971 field season, ch lasted from before the initiation of snowmelt in late winter to late summer. Each feature was classified as to when it formed, how long it persisted, and what processes were involved. It was found that winter, although it prevails throughout most of the year, is generally a period of little activity on Putu bar. Most alterations on the bar are the result of the fluvial activity occurring during the short spring and summer. Cryoturbation, an important process in the development of many arctic landforms, is negligible in the formation of the microrelief features investigated on Putu bar. (Sims-ISWS)

ACCUMULATING SNOW TO AUGMENT THE FRESH WATER SUPPLY AT BARROW, ALASKA,

Cold Regions Research and Engineering Lab., Hanover, N. H.

C. W. Slaughter, M. Mellor, P. V. Sellmann, J. Brown, and L. Brown.

Available from the National Technical Information Service, Springfield, Va 22161 as ADA-005-031, \$3.50 in paper copy, \$2.25 in microfiche. Spe-cial Report 217, January 1975. 21 p, 12 fig, 4 tab, 16 ref. append.

Descriptors: *Snow management, *Water supply. *Alaska, Windbreaks, Permafrost, Reservoirs, Runoff, Snowfall, Snowmelt, Surface waters, Water storage, Water distribution(Applied), Water delivery, Arctic, Cold regions, Snow, Snowpa Identifiers: *Snow accumulation, Barrow(Alaska), Snow fence.

With appropriate snow management techniques, it appears that local freshwater runoff could be significantly increased in northern Alaska to provide additional water for community needs. At Barrow, Alaska, snow fences 1.5 and 2.7 m high were installed in September 1972 at two orientations (north-south and east-west). By February 1973 the fences were near saturation. Influence of the fences was evident at 10-15 times fence height on both sides of the fences. Surface reworking and slight accumulation increases were shown in subsequent April and June measurements. Snow accumulation on adjacent, relatively flat terrain at all three measurement times was about 40 cm depth. The average increase in water equivalent over the drift cross section for the 1.5 m fence was 15 cm. with a maximum of 50 cm within 1.0 m of the fences. For the 2.7 m fence, the average increase in water equivalent was 45 cm, with a maximum of 1.5 m within 1 meter of the fence. Snow density each measurement time was in the range of 0.40 to 0.55 g/cu m. (Roberts-ISWS) W76-01323

UNIVERSITY OF WASHINGTON WATER STRESS STUDIES,

Washington Univ., Seattle. Dept. of Oceanog-

raphy.

L. K. Coachman, and J. D. Smith. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as AD-A005 373, \$3.50 in paper copy, \$2.25 in microfiche. Technical Report No 2, January 1971. 8 p, 1 fig, 19 ref. ONR N00014-67-A-0103-0021.

Descriptors: *Sea ice, *Arctic Ocean, *Ocean currents, Hydrodynamics, Ocean waves, Boundary layers, Boundary processes, Projects, On-site in-vestigations, Fluid mechanics, Stress, Oceanography. Identifiers: *Water stress.

During the 1970 AIDJEX Pilot Study, the University of Washington oceanographic study explored possible techniques for measuring water stress on possible techniques for measuring water steeps on the ice and ice deformation. The specific experi-ments outlined for the 1971 pilot study were: (1) the measurement of the time-dependent velocity and Reynolds stress fields in the nonuniforms turbulent boundary layer under the ice; (2) current measurements to relate the deeper flows to those in the boundary layer; (3) to measure the approach to geostrophy of the flow; and (4) accurate positioning of the two satellite stations as well as of the main station, so that the deformation of the triangle could be followed. (Sims-ISWS)

THEORETICAL CALCULATIONS OF INTER-NAL WAVE DRAG ON SEA ICE, Washington Univ., Seattle. Dept. of Atmospheric

Sciences

Available from the National Technical Informa Technical Report No 26, 1974. 12 p, 6 fig, 9 ref. ONR N00014-67-A-0103-0007.

Descriptors: *Sea ice, *Internal waves, *Drag, *Arctic Ocean, Hydrodynamics, Interfaces, Waves(Water), Ocean waves, Model studies, Mathematical models, Fluid mechanics, Dynamics, Stress, Oceanography. Identifiers: *Water stress.

Because of the density stratification in the upper part of the Arctic Ocean, the movement of pressure ridge keels through the mixed layer can create internal waves in the vicinity of the pycnocline. These waves transport energy away from the keels and thereby generate drag on the ice. The study defined the conditions under which wave drag could contribute significantly to the total water stress. The development of internal waves downstream from a semielliptical keel was described by a simple two-dimensional, two-layer ocean model. Results calculated from the model showed the dependence of wave drag on keel depth, current speed, depth of the upper layer, and density change across the interface between the layers. Comparison of the relative magnitudes of form drag and wave drag suggested that wave drag is not negligible near large keels when the current is flowing strongly. (Sims-ISWS) W76-01486

CHARACTERIZATION OF SLUSH ICE IN THE GREAT LAKES.

Coast Guard Research and Development Center, Groton, Conn.

J. P. Welsh, and B. T. Kingsbury.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as AD-A006 450, \$3.50 in paper copy, \$2.25 in microfiche. Report No CG-D-45-75, November 1974. 17 p, 10 fig, 3 tab.

Descriptors: *Ice, *Slush, *Lake ice, Lakes, Surveys, On-site investigations, Measure-ment, Ice cover, Ice-water interfaces, Iced lakes, Navigation, Lakes. Identifiers: "Slush ice.

Slush ice is a mixture of fresh water ice and water. It becomes an impediment to navigation when wind and water current transport the ice fragments into a restricted channel or harbor. The characteristics of slush ice identified and measured were draft, ice to water ratio (surface aspect only), and ice particle size distribution. Draft was measured using a sonar transducer set on the bottom of a el and echoing off the underside of the slush ice. The water to ice ratio was obtained from photographs of slush ice taken from a helicopter. The ice particle size distribution was obtained by physically measuring ice particles in the field. The last technique is only useful where one can walk

Streamflow and Runoff-Group 2E

on the slush ice. The ability to gather other data that may characterize slush ice is hindered by many factors. For example, conventional approaches to field observation and sampling are not very useful. One reason is that slush ice cannot always be walked on [cime_ISWE] ways be walked on. (Sims-ISWS) W76-01487

METHODS OF AVALANCHE CONTROL IN WASHINGTON MOUNTAIN HIGHWAYS--SUM-MARY REPORT,

MARY REPORT,
Washington Univ., Seattle. Dept. of Civil Engineering; and Washington Univ., Seattle.
Geophysics Program.
E. R. LaChapelle, C. B. Brown, and R. J. Evans.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 107,
33.50 in paper copy, \$2.25 in microfiche. Research
Program Report 8.6, July 1974, 18 p. 1 tab, 12 ref, 2 append.

Descriptors: *Avalanches, *Protection, *Highways, *Washington, Snow, Snow management, Hazards, Disasters, Safety, Mountains, Forests. Identifiers: *Avalanche control.

This summary report synthesized the work on avalanche control carried out at the University of Washington from 1970-1974. The annual reports contained a full account of all of the activities and should be referred to for further details. Five problems were faced in the protection of a highways from avalanche catastrophe. These were: (1) identification of avalanche paths, (2) description of historical frequency and size of avalanches, (3) prediction of avalanching, (4) identification of control methods, and (5) inclusion of control and prediction schemes in highway design and operation. The summary was intended to bring together the four-year study under the problem titles identified. Most of the work has been addressed to the specific features of the North Cascades Highway (SR-20) in the North Cascade Mountains of Washington State. Applications to other sites were mentioned as they arose. W76-01492

2D. Evaporation and Transpiration

ESTIMATING EVAPORATION AND TRANS-PORTATION FROM CLIMATOLOGICAL OB-SERVATIONS, Dept. for the Environment. Ottawa (Ontario).

Hydrology Research Div.

F. I. Morton Journal of Applied Meterology, Vol 14, No 4, p 488-497, June, 1975. 5 fig, 10 ref, append.

*Evaporation, Descriptors: "Model studies, "Estimating, "Climatic data, Physical properties, Climatology, Evaporation pans, Evapotranspiration, Hydrologic cycle, Solar *Climatic data, radiation, Temperature, Water balance, Water loss, Humidity, Systems analysis, Mathematical models, Synthetic hydrology, River basin, Air temperature, Photoperiodism

Evaporation and transpiration are estimated from rountine climatological observations using a con-ceptual model that requires no assumptions concerning the availability of water. The versatility of this unorthdox approach is demonstrated by comparing model and water budget estimates for 118 river basins in Canada, Ireland and the southern United States. This technique provides estimates of evaporation and transpiration from a large area from interactions with the temperature, humidity and sunshine duration without using local fudge factors. The model requires accurate humidity data. It cannot be used near sharp environmental discontinuities, for short time periods, for deep lakes with large seasonal changes in subsurface heat storage, or to predict the effects of natural or man-made changes. (Robinett-Arizona) W76-01122

EFFECT OF MOISTURE STRESS ON RED MAPLE SEEDLINGS FROM DIFFERENT SEED SOURCES

Agricultural Research Service, Delaware, Ohio. ade Tree Ornamental Plants Lab. A. M. Townsend, and B. R. Roberts

A. M. Roberts, and B. R. Roberts. Can J Bot. Vol 51, No 10, p 1989-1995. 1973. Illus. Identifiers: Acer-Rubrum *Maple trees, *Red ma-ples, *Seedlings, Siblings, Swamps, *Moisture stress, Sites, *Transpiration.

Red maple (Acer rubrum I...) seedlings grown from half-sib seed collected from wet and dry sites were subjected to 3 levels of plant water stress. Transpiration on a per seedling and per unit leaf weight basis was greatest in seedlings from a swamplike site, at both high and low water potentials. Seedlings from the 2 wet sites came to temporary and permanent wilt sooner than seedlings from dry sites. However, at all levels of water stress, growth rates were greater for the seedlings from the wet sites than for those from the dry sites. At permanent wilt, the stem and leaf moisture content and the water potential values were highest in the seedlings from the swamplike site. At temporary wilt, the leaf water potential was lowest in seedlings from dry sites. Transpiration of seedlings from a swamplike site was double that of those from another wet site at the same leaf water potential.--Copyright 1974, Biological Abstracts, W76-01196

SIMULATION OF EVAPORATION FROM BARE SOIL UNDER STEADY AND DIURNALLY FLUCTUATING EVAPORATIVITY,

Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences and Texas Agricultural Extension Service, College Station.

Soil Science, Vol 120, No 3, p 230-237, September 1975. 7 fig, 16 ref.

Descriptors: *Simulation analysis, *Soil moisture, Numerical analysis, Soils, Evaporation, Time, Computers, Diurnal distribution, Cycles, Soil surfaces, Computer programs, Model studies, Flow system.

Identifiers: *Mechanistic numerical model, evaporation, Resorption, IBM *Potential System/360, Cyclic egvaporativity, Vapor diffusion, Isothermal flow theory.

A mechanistic numerical model was designed to compare evaporation of soil moisture under steady versus fluctuating evaporativity. The model, written in IBM System/360 CSMP language, required data on soil hydraulic characteristics and on potential evaporation. It calculated the rate and cumulative quantity of evaporation, as well as the change in profile water content and distribution, as functions of time. Computations carried out for a 10day simulation illustrated the use of the model. The results confirmed experimental findings that the diurnal cycle of evaporativity caused nighttime resorption of moisture and hence an appreciably higher average wetness in the soil surface zone. The results also predicted that under cyclic evaporativity, the total evaporation tended to be lower than under the equivalent steady evaporativity. (Roberts-ISWS) W76-01302

COMPARISON OF WARM WATER EVAPORA-

Canterbury Univ., Christchurch (New Zealand), Dept. of Civil Engineering. R. N. Weisman.

R. N. Weisman. Journal of the Hydraulics Division, American Sogiety of Civil Engineers, Vol 101, No HY10, Proceedings Paper 11620, p 1303-1313, October 1975. 2 fig. 2 tab, 12 ref, 2 append.

Descriptors: *Evaporation, *Turbulence, Turbulent flow, Water, Velocity, Convection, Water vapor, Heat transfer, Momentum equation, Model studies, Roughness(Hydraulic), Friction, Bodies of water, Hydrology, Fluid mechanics, Cooling water, Hydraulics.

Identifiers: *Warm water evaporation, *Turbulent diffusion, Forced convection, Sensible heat flux, Empirical model, Fluid mechanical model, Velocity profile, Friction velocity, Roughness length.

Two methods of calculating the evaporation and, using the Bowen ratio, the sensible heat flux from warm water bodies were presented and their results compared. One method was empirical in that free convective and forced convective terms were simply added. The other method was a fluid mechanical approach combining the effects of free and forced convection in a nonlinear way by the use of the Monin-Obukhov similarity theory. The comparison of results depended on the value of roughness length. A specific roughness length allowed the results of the two methods to compare within several percent. (Roberts-ISWS) W76-01310

GAMMA-THE PSYCHROMETER NON-CON-

STANT, Atmospheric Environment Service, Calgary (Alberta).

Journal of Applied Meteorology, Vol 14, No 7, p 1397-1398, October 1975. 2 fig, 1 tab, 8 ref.

*Evapotranspiration, Descriptors: budget, *Estimating, Analytical techniques, Pressure, Elevation, Humidity, Equations, Meteorology, Hygrometry. Identifiers: *Psychrometer constant, Gamma,

Potential evapotranspiration.

Using 0.66 mb/degree K for gamma, the psychrometric constant, can cause underestimates of evapotranspiration in excess of 5% at elevations above 1000 m. Graphs and equations were presented to prevent this error and to facilitate the caluclation of evapotranspiration. (Sims-ISWS) W76-01473

ENERGY BUDGETS FOR THREE SMALL PLOTS-SUBSTANTIATION OF PRIESTLEY AND TAYLOR'S LARGE-SCALE EVAPORA-TION PARAMETER,

Rocky Mountain Forest and Range Experiment Station, Tempe, Ariz.

J. R. Thompson.

Journal of Applied Meteorology, Vol 14, No 7, p 1399-1402, October 1975, 2 fig. 1 tab, 7 ref.

Descriptors: *Evaporation, *Forests, *Energy budget, *Arizona, Data processing, Evapotranspiration, Latent heat, Solar radiation, Equations, emperature, Humidity, On-site investigations, Meteorology.

Eleven days of energy balance data from three unsaturated land surfaces were collected in the White Mountains of Arizona. These data indicated the variability in alpha for unsaturated conditions, and seemed to verify that a constant value of 1.26 exists for saturated conditions. The 'index of aridi-(alpha/1.26), though not entirely logical for small-scale use, also seemed to substantiate the large-scale parameter. (Sims-ISWS)

2E. Streamflow and Runoff

MATHEMATICAL MODEL FOR THE FILLING PROCESS OF THE RETENTION BASIN STOEHNA (MATHEMATISCHES MODELL FUER DEN FUELLVORGANIC DES

Group 2E-Streamflow and Runoff

HOCHWASSER-RUECKHALTEBECKENS

STOEHNA), M. Meyer, H. Martin, and W. Kraatz. Wasserwirtschaft/Wassertechnik, Vol 22, No 11, p 382-386, 1972. 5 fig, 2 ref.

Descriptors: *Mathematical models, *Model studies, Flow, Flood peak, Rivers, Flood control, Flood gates.
Identifiers: Flood retention basins.

A mathematical model is shown applicable to the simulation of nonstationary flow processes occurring during the filling of similar flood gate-controlled retention basins. The nonstationary flow process makes it necessary to assume the inflow according to the progress line to be constant during discrete intervals. Partial inflows are determined for the preset geometrical boundary conditions of the flow profiles in assuming a steady state for the individual intervals. Branching and friction losses as well as secondary flow are not considered in the model. Designed to level off flood peaks in a river, this model constitutes a valuable element in the planned process control of flood retention basins. (Sandoski-FIRL)

THE UTILIZATION OF TREE-RING DATA TO PREDICT HYDROLOGIC PROPERTIES OF SEMIARID WATERSHEDS NEAR TUCSON, ARIZONA.

ARIZONA, Arizona Univ., Tucson. Dept. of Watershed Management.

Master of Science Thesis, 1974, 106 p, 12 tab, 14 fig. 4 append, 87 ref.

Descriptors: *Climatic data, *Watersheds(Basins), *Dendrochronology, *Hydrologic cycle, *Runoff forecasting, Douglas fir trees, Runoff, Arizona, Streamflow, Flood forecasting, Flow, Precipitation, Mountain forests.

Identifiers: *Sabino Creek(Ariz), *Rincon Creek(Ariz), *Rillito Creek(Ariz), Tucson Basin(Ariz).

Four douglas-fir chronologies were collected from the mountains surrounding the Tucson basin. These tree-ring indices were analyzed and compared to the runoff records of Sabina Creek watershed, Rincon Creek watershed, and Rillito Creek watershed. The reconstructed data covered a 313 year period. The total variance explained by the prediction equation was 35% for Sabino Creek, 64% for Rillito Creek, and 34% for Rillito Creek. This runoff prediction was considered satisfactory for the Tucson Basin. (McLachlan-Arizona)

SURFACE WATERS,

National Weather Service, Silver Spring, Md. J. C. Schaake, Jr. Reviews of Geophysics and Space Physics, Vol 13, No 3, p 445-451, 494-496, July, 1975, 65 ref.

Descriptors: *Surface waters, *Streamflow, *Synthetic hydrology, *Hydraulics, *Mathematical models, Hydraulic models, Rivers, Runoff, Streams, Surface runoff, River flow, River forecasting, Watershed(Basins), Hydrographs, Overland flow, Statistical methods, Simulation analysis, Computer models, Probability, Land use, Bibliographies.

Discussed are work done and important advances made in the areas of river mechanics and streamflow routing, experimental study of overland flow, surface runoff models, partial area processes, effects of land use on surface runoff, and probability, statistics and analysis of uncertainty. In each area there was a fundamental need to apply mathematical and computer methods, and this is reflected in the review of progress in each of these areas. (Robinett-Arizona)

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Reston, Va.

For primary bibliographic entry see Field 2K. W76-01176

SURFACE SUPPLY OF THE UNITED STATES, 1966-70: PART 3. OHIO RIVER BASIN-VOLUME 3. OHIO RIVER BASIN FROM LOUISVILLE, KENTUCKY, TO WABASH RIVER.

RIVER. Geological Survey, Reston, Va. Supt. of Documents, GPO, Wash., D.C. 20402 Price \$5.20. Water-Supply Paper 2109, 1975. 633 p, 1 fig.

Descriptors: *Basic data collections, *Surface water, *Streamflow, *Flow rates, *Ohio River, River basins, Illinois, Indiana, Kentucky, Tennessee, Gaging stations, Runoff, Discharge(Water), Flow measurement, Average flow, Water levels, Lakes, Reservoirs, Hydrologic data. Identifiers: *Ohio River basin, Maximum discharges, Minimum discharges.

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Ohio River basin from Louisville, Kentucky, to Wabash River. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965 to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 1.' NORTH ATLANTIC SLOPE BASINS-VOLUME 1. BASINS FROM MAINE TO CONNECTICUT.
Geological Survey, Reston, Va.

Supt. of Documents, GPO, Wash. D.C. 20402 Price \$8.60. Water-Supply Paper 2101, 1975. 1123 p, 1 fig.

Descriptors: *Basic data collections, *Surface water, *Streamflow, *Lakes, *Northeast US, River basins, Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Vermont, Runoff, Discharge(Water), Gaging stations, Flow measurement, Flow rates, Average flow, Water levels, Reservoirs, Hydrologic data. Identifiers: *North Atlantic Slope basins, Maximum discharges, Minimum discharges.

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the North Atlantic slope basins, Maine to Connecticut. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for streamgaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum and minimum discharges. (Woodard-USGS) W76-01178

HYDROLOGIC DATA FOR LITTLE ELM CREEK, TRINITY RIVER BASIN, TEXAS, 1973, Geological Survey, Austin, Tex. R. M. Slade, Jr., and J. M. Taylor. Open-file report, May 1975. 74 p, 2 fig, 3 tab.

Descriptors: *Hydrologic data, *Small watersheds, *Texas, *Rainfall-runoff relationships, Streamflow, Gaging stations, Flood protection, Flood control, Retaining walls, Hydrographs. Identifiers: *Little Elm Creek(Tex), *Trinity Riverbasin(Tex).

This report, the fourteenth in a series of basic-data reports published annually for the Little Elm Creek, Texas study area, contains the rainfall, runoff, and storage data collected during the 1973 water year for the 75.5 sq mi area above the stream-gaging station Little Elm Creek near Aubrey. The investigation is scheduled to continue through a period of both above- and below- normal precipitation to define the various factors used in the analyses of rainfall-runoff relationships. There are 12 floodwater- retarding structures in the Little Elm Creek watershed upstream from the streamgaging station Little Elm Creek near Celina. These structures have a combined capacity of 9,490 acreft below the emergency spillway and control runoff from 28.4 sq mi or 61 percent of the area above the Celina stream-gaging station. Four floodwater-retarding structures are located in the area between the Celina and Aubrey stream-gaging stations. The 16 floodwater-retarding structures have a combined capacity of 12,340 acre-ft below the emergency spillway and control runoff from 35 sq mi, or 47 percent of the area above the Aubrey stream-gaging station. The average rainfall during the 1973 water year was 49.66 in or 133 percent of the 17-year (1957-73) average of 37.25 in. for the area. Monthly rainfall totals ranged from 0.68 in in December to 8.20 in in September. (Woodard-W76-01181

FLOODS IN EASTERN LAJAS VALLEY AND THE LOWER RIO LOCO BASIN, SOUTHWESTERN PUERTO RICO,

Geological Survey of Puerto Rico, San Juan. K. G. Johnson.

Hydrologic Investigations Atlas HA-532, 1974. 1 sheet, 4 fig, 3 tab, 5 ref.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Hydrologic data, *Puerto Rico, Maps, Hydrographs, Flood frequency, Flood data, Land use, Planning.
Identifiers: *Eastern Lajas Valley(PR), *Lower Rio Loco basin(PR).

Factual and interpretive information is provided for floods in eastern Lajas Valley and the lower Rio Loco basin in Puerto Rico. The land is devoted almost entirely to agriculture (mostly to the production of surgarcane). Occasional tropical storms and hurricanes can produce torrential rains, which usually cause flooding. Parts of the study area have been inundated extensively at least four times since the greatest known flood of September 13, 1928. Eighteen bridges are in the flood area. The water surface during the 1928 flood was above low beam on 12 of these bridges and 10 of the 12 bridges were inundated. Flood profiles were developed on the basis of elevations of floodmarks. (Woodard-USGS) W76-01182

FLOODS IN LOMBARD QUADRANGLE, IL-LINOIS,

Geological Survey, Champaign, Ill. H. E. Allen, and V. J. May.

For sale by USGS, Reston, Va. 22092 Price \$1.25 per set. Hydrologic Investigations Atlas HA-143, 1964 (reprinted 1975). 1 sheet, 7 fig.

Descriptors: *Floods, *Flood profiles, *Flood data, *Flood plains, *Illinois, Hydrologic data, Flood frequency, Maps, Hydrographs, Land use, Planning.
Identifiers: *Lombard quadrangle(III).

Streamflow and Runoff-Group 2E

The approximate areas inundated by floods along The approximate areas inundated by floods along streams in the Lombard 7 1/2-minute quadrangle in Illinois are delineated on a topographic map. Inundated areas are shown along Winfield Creek for the flood of May 1954; along Spring Brook, Meacham Creek, and East Branch Du Page River Meacham Creek, and East Branch Du Page River for the flood of October 1954; and along unnamed tributaries of East Branch Du Page River, Salt Creek tributary, and Klein Creek for the flood of September 1961. This study of hydrologic data should help to evaluate the depth and frequency of flooding that affect the economic development of flood plains. (Woodard-USGS)

FLOODS IN THE CAROLINA-RIO GRANDE AREA, NORTHEASTERN PUERTO RICO. Geological Survey of Puerto Rico, San Juan. W. J. Haire.

For sale USGS, Reston, Va 22092, Price \$1.25. Hydrologic Investigations Atlas HA-533, 1975. 1 sheet, 7 fig. 4 tab, 7 ref.

Descriptors: *Floods, *Puerto Rico, *Flood profiles, *Flood data, Maps, Streamflow, Flow rates, Peak discharge, Flood frequency, Hydrographs.
Identifiers: *Carolina-Rio Grande area(PR).

This atlas provides hydrologic information on major floods in the Carolina-Rio Grande area, Puerto Rico. The data include tabulations of flood discharge and flood stage, flood profiles, and a map of the area inundated by the floods of September 6, 1960, and October 9, 1970. The areas of inundation and the flood profiles are specifically for conditions that existed at the time of the floods. A tabulation of flood-frequency data is presented for selected sites. The peak discharge of Rio Grande de Loiza at Loiza Dam was 170,000 cts in 1960; for the 1970 flood it was 146,000 cfs. Upstream at the Caguas gaging station peak discharge was 71,500 cfs in 1960 and 62,800 cfs in 1970. (Woodard-USGS)

MAP SHOWING FLOOD-PRONE AREAS, GREATER DENVER AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,

Geological Survey, Denver, Colo. J. F. McCain, and W. R. Hotchkiss. For sale USGS, Reston, Va 22092, Price \$0.75. Miscellaneous Investigations Series Map I-856-D, 1975. I sheet, I map, 21 ref.

*Flood plains, *Maps, Descriptors: Descriptors: "Flood plains, "Maps, "Urbanization, "Flood protection, "Colorado, Flood frequency, Land development, Land use, Streamflow, Flow characteristics, Hydrologic data, Flood plain zon Watershed management. Identifiers: "Greater Denver area(Colo).

The rapid growth of population in the Front Range Urban Corridor of Colorado is causing intense competition for available land resources. One form of competition posing serious problems is in-discriminate development of flood plains along creeks and rivers. This map depicts a broad-scale view of flood-prone areas along principal streams in the Greater Denver area of the urban corridor. Flood-prone areas identified are subject to inundarion by the 100-year flood-a flood having a 1 percent chance of being equaled or exceeded in any given year. The magnitude and depth of this reference flood were derived for streams in the study area from streamflow records and reports of the U.S. Geological Survey, reports of the U.S. Army Corps of Engineers, and from reports prepared by various consulting engineering firms for the Urban Drainage and Flood Control District. (Woodard-USGS) W76-01186

MAP SHOWING FLOOD OF APRIL 1975 AT EAST LANSING, MICHIGAN, Geological Survey, Lansing, Mich.

R. L. Knutilla, and L. A. Swallow. Open-file map, 1975. 1 sheet, 8 fig, 2 tab.

Descriptors: *Floods, *Maps, *Flood data, *Streamflow, *Michigan, Flow measurement, Discharge(Water), Flood damage, Aerial photog-raphy, Hydrographs, Flood peak, Peak discharge, Flood frequency, Sediment transport, Hydrologic data, Rainfall, Smowmelt.

Identifiers: *East Lansing flood April 1975, *Red Cedar River(Mich).

This is one of a series of map reports on the April 1975 flood in the Lansing, Michigan metropolitan area. The drainage area of the Red Cedar River at East Lansing is 355 square miles. About two weeks prior to the flood a heavy snow fell over most of the Red Cedar River basin. As much as 13 inches were recorded at some places. Subsequent melting increased streamflow. The extent of flood-ing along the Red Cedar River is shown on a hotomosaic base map. A discharge hydrograph for the Red Cedar River at East Lansing shows the peak discharge of 5,940 cfs which occurred near midnight on April 20. This discharge is equivalent to a runoff of about 16.7 cfs per square mile of drainage area. A maximum sediment concentration of about 350 mg/litre at the gaging station on the Red Cedar River at East Lansing occurred on April 20; peak concentrations occurred several hours prior to the time of peak discharge. During the April 19-24 period, an estimated 11,500 tons of suspended sediment passed the gaging station. The flood has a recurrence interval of about 40 years. or about 2.5 percent chance of occurrence in any year. (Woodard-USGS) W76-01188

MAP SHOWING FLOOD OF APRIL 1975,

LANSING, MICHIGAN, Geological Survey, Lansing, Mich. J. B. Miller, and L. A. Swallow. Open-file map, 1975. 2 sheets, 14 fig, 3 tab.

Descriptors: *Floods, *Maps, *Flood data, *Michigan, *Streamflow, Flow measurement, Discharge(Water), Flood damage, Aerial photography, Hydrographs, Flood peak, Peak discharge, Flood frequency, Sediment transport, Hydrologic data, Rainfall, Snowmelt. Identifiers: *Lansing flood April 1975(Mich).

Discharge data for the flood of April 1975 in the Lansing, Mich., area were obtained on the Grand River at Lansing, Red Cedar River at East Lansing, Sycamore Creek near Holt, Mud Lake Drain near Lansing, and Carrier Creek near Lansing. Discharge hydrographs for these gaging stations are shown. The peak discharge of 11,200 cfs occurred on the Grand River at 6 p. m. on April 20. This discharge is equivalent to a runoff of 9.11 cfs per square mile of drainage area. The extent of flooding along the Grand River and the lower reaches of the Red Cedar River is shown on photomosaic base maps. Maximum sediment con-centrations on the Grand River at the gaging station at Lansing were 300 to 350 mg/litre on April 19 and 20; peak sediment concentrations occurred several hours prior to the time of peak flow. During the April 19-24 period, an estimated 26,000 tons of suspended sediment passed the gaging station. The flood had a recurrence interval of slightly more than 10 years, or about a 10 percent chance of occurrence in any year. (Woodard-USGS) W76-01189

MAP SHOWING FLOOD OF APRIL 1975 AT WILLIAMSTON, MICHIGAN, Geological Survey, Lansing, Mich. R. L. Knutilla, and L. A. Swallow. Open-file map, 1975. I sheet, 9 fig, 1 tab.

Descriptors: *Floods, *Maps, *Flood data, *Michigan, *Streamflow, Flow measurement, Discharge(Water), Flood damage, Aerial photography, Flood peak, Peak discharge, Snowmelt, Flood frequency, Rainfall, Hydrologic data.

Identifiers: *Williamston(Mich), *Red Cedar River(Mich).

On April 18, 1975 the city of Williamston, Mich., experienced an intense rain storm that caused the Red Cedar River and the many small streams in the area to overflow their banks and resulted in the most devastating flood since at least 1904. Local officials estimated a loss of \$775,000 in property damage. The extent of flooding along the Red Cedar River and Deer Creek is shown on the photomosaic base maps. The drainage area of Red Cedar River at Williamston is about 240 square miles. During the 7-hour duration of the April 18 storm, Williamston received 4.89 inches of rain. Precipitation of that intensity can be expected to occur only about once every 100 years on the average. At the time of the storm, streamflow was relatively high as a result of snowmelt from a heavy snowfall that had occurred 2 weeks earlier. The peak discharge at East Lansing was 5,940 cfs or 17 cfs per square mile. Runoff of Deer and Sloan Creeks was appreciably higher than for the Red Cedar at Williamston. (Woodard-USGS) W76-01190

THE HYDROLOGY OF GLACIERS. British Columbia Univ., Vancouver. Dept. of Geology. For primary bibliographic entry see Field 2C. W76-01246

HYDROLOGY OF GLACIERIZED BASINS--SUMMARY OF RESEARCH BY GLACIOLOGY SUBDIVISION, Department of Fisheries and Forestry, Ottawa

(Ontario). Inland Waters Branch. For primary bibliographic entry see Field 2C. W76-01247

DIMENSIONLESS INLET HYDROGRAPH MODEL, Maryland Univ., College Park. Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W76-01256

MEANDERING OF SUPRAGLACIAL MELT STREAMS.

Alberta Univ., Edmonton. Dept. of Civil Engineer-

Water Resources Research, Vol 11, No 4, p 551-552, August 1975. 2 fig, 4 ref.

*Geomorphology, *Meanue., Channels, Melt Descriptors: Glaciohydrology, Streams, Channels, Melt water, Melting, Freezing, Hydrodynamics, Heat transfer, Streamflow, Supercritical flow. Identifiers: *Supraglacial melt streams.

During periods of glacial ablation, excess water often concentrates in supraglacial melt streams, which typically exhibit meandering. A stability analysis of straight supraglacial streams was car-ried out to determine the nature of meandering tendencies. Instability leading to meandering in the flow results from a combination of hydrodynamic and differential heating effects. The heat involved is apparently largely frictional. The analysis indicated that instability occurs only for supercritical flow and that the meander pattern does not migrate downstream. Meander wavelength was determined by channel width, depth, and Froude number. The results agreed with field observa-tions. (Jess-ISWS) W76-01261

WATER DECONTAMINATION THROUGH RAIN WATER TREATMENT IN STORM WATER RETENTION TANKS (ENTLASTUNG DER GEWASSER DUCH BEHANDLUNG DES

Group 2E-Streamflow and Runoff

REGENWASSERS IN REGENUEBERLAUF-BECKEN), K. Krauth.

Wasserwirtschaft, Vol 63, No 2, p 42-46, February, 1973. 12 fig, 2 tab, 6 ref.

Descriptors: *Storm water, *Retention, *Waste water treatment, Sewerage, Canals, Design criteria, Overflow, Nutrient removal, Flow dura-

Identifiers: Storm water retention tanks, Clarifica-

Recently developed storm water retention tanks to prevent main canal overload through polluted water have a bottom discharge, one of several overload outlets, and whose efficiency depends on their position in the sewer system. Criteria in-volved in their design include oveerflow frequency and quantity, the amount of sediment discharged into the main canal, and sediment load conveyed for clarification. Other factors include the average annual sediment, the frequency and extent by which this average is exceeded, and the effect of removed undissolved matter, oxygen-consuming organic matter, and nitrogen and phosphorus-con-taining nutrients. It is suggested that maximum inflow and minimum detention time factors should be used in the sizing of storm water retention tanks for sewer systems having preliminary discharge facilities and with flow durations exceeding 15 minutes. (Sandoski-FIRL)

SPECIAL SOLUTIONS FOR NONLINEAR ERO-SION PROBLEMS, Minnesota Univ., Minneapolis. School of Mathe-

For primary bibliographic entry see Field 2J. W76-01296

CALIFORNIA HIGH WATER, 1972-1973, California State Dept. of Water Resources, Sacramento. Div. of Resources Development. mento. Div. of Resources Development.
W. A. Arvola, J. S. Bartok, W. B. Chan, J. C.
Bringham, and G. W. Patrick.
Available from California Dept. of Water
Resources, Sacremento, 95802, for \$2.00, Bulletin
No. 69-73, December 1974. 34 p, 6 fig, 1 tab, 2 ap-

pend.

Descriptors: *Floods, *California, *Flooding, *Mudflows, *Storms, *Storm runoff, Runoff, Drainage, Rainfall, Excessive precipitation, Streamflow, Weather patterns, Tides, Winds, Flood stages, Hydrographs, Hydrology, Precipitation(Atmospheric), Peak discharge, Flood damage, Disasters.

The weather patterns of the 1972-73 flood season in California were characterized by a southerly displacement of the storm track which produced above-normal rainfall through the midcoastal and Central Valley areas of the state. This precipitation produced no significant flooding by any of the state's major streams; however, the combination of abundant and high-intensity rainfall caused local floods and mudslides so large and numerous that ten counties and one city were declared dis-aster areas during the season. The bulletin, 11th in an annual series, covered the period from October 1, 1972 through September 30, 1973, and described precipitation, runoff, flooding and the general weather patterns that preceded and coincided with storm periods. Also included were tabulations of precipitation comparisons and peak streamflows and stages, hydrographs of streamflow and reservoir operations, and weir overflow graphs. (Robinson-ISWS) W76-01315

FLOOD OF JUNE 1972 IN THE SOUTHERN PEACE (SMOKY RIVER) BASIN, ALBERTA, Department of the Environment, Calgary (Alberta). Water Resources Branch. L. A. Warner, and W. C. Thompson.

Technical Bulletin No 87, 1974. 51 p, 16 fig, 8 plates, 3 tab, 4 ref, 3 append.

Descriptors: *Floods, *Flood damage, *Canada, Flood stages, Streams, Inflow, Rivers, Hydrographs, Precipitation(Atmospheric), Stream gages, Discharge(Water), Streamflow, Ice jams, Peak discharge.

Identifiers: *Peace River, *Alberta, Flood hydrographs, damage. Maximum discharges, Agricultural

Record flows in nearly all streams of the Peace River basin southwest of Grand Prairie followed more than 6 inches of rain in June 1972. Flood damage was reported in Grande Prairie, Grande Cache, Watino, and the town of Peace River. Calculations indicated that the influence of the W.A.C. Bennett Dam and diking operation in the town probably reduced the severity of flooding at Peace River townsite. The effect of the diking operation on water levels associated with an ice jam in April 1973 was discussed in an appendix. Details on agricultural flood damage incurred by farmers along the Peace River system were ex-cerpted from 'Flood Damage Estimation, June 1972, Athabasca, North Saskatchewan and Peace River Basins' by J.L. Knapp, Alberta Department of Agriculture. Flood waters of the Smoky and Peace Rivers combined at Peace River townsite to produce a discharge of 550,000 cfs. The report gave a description of the flood, including meteorological analysis, flood hydrographs, and maximum discharges. Flood frequency analyses for two gage sites were presented. Hourly discharges were given for 7 sites and peak flows for two sites. (Roberts-ISWS) W76-01316

MORPHOLOGY OF AN ARCTIC RIVER BAR, Louisiana State Univ., Baton Rouge. Center for Wetlands Resources; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst. For primary bibliographic entry see Field 2C.

MISSISSIPPI RIVER MOUTH PROCESSES: EF-FLUENT DYNAMICS AND MORPHOLOGIC DEVELOPMENT. Louisiana State Univ., Baton Rouge, Coastal Stu-

For primary bibliographic entry see Field 2L.

SPECIAL FLOOD HAZARD REPORT: CAMP-BELL CREEK, GREATER ANCHORAGE

Army Engineer District, Anchorage, Alaska. For primary bibliographic entry see Field 4A. W76-01361

W76-01321

PLAIN INFORMATION: FLOOD CREEK, ORANGE COUNTY, CALIFORNIA. Army Engineer District, Los Angeles, Calif. For primary bibliographic entry see Field 4A. W76-01362

SPECIAL FLOOD HAZARD INFORMATION: BEAR AND EVANS CREEKS, REDMOND AND VICINITY, WASHINGTON. Army Engineer District, Seattle, Wash. For primary bibliographic entry see Field 4A. W76-01363

FLOOD PLAIN INFORMATION: EIGHT MILE CREEK, VICINITY OF PARAGOULD, ARKAN-SAS.

Army Engineer District, Memphis, Tenn For primary bibliographic entry see Field 4A. W76-01364 FLOOD PLAIN INFORMATION: PART I BAYOU BARTHOLOMEW AND TRIBUTARIES, CITY OF PINE BLUFF, ARKANSAS. Army Engineer District, Vicksburg, Miss. For primary bibliographic entry see Field 4A. W76-01365

SPECIAL FLOOD HAZARD INFORMATION: WOLF LODGE CREEK AND TRIBUTARIES, VICINITY OF COUER D'ALENE, IDAHO. Army Engineer District, Seattle, Wash For primary bibliographic entry see Field 4A. W76-01367

FLOOD PLAIN INFORMATION: POCOSHOCK AND POCOSHAM CREEKS, CITY OF RICHMOND AND CHESTERFIELD COUNTY, VIRGINIA.

Army Engineer District, Norfolk, Va For primary bibliographic entry see Field 4A. W76-01368

FLOOD PLAIN INFORMATION: CASPER, WYOMING, VOLUME III, NORTH PLATTE RIVER.

Army Engineer District, Omaha, Nebr. For primary bibliographic entry see Field 4A. W76-01369

FLOOD PLAIN INFORMATION: ST. JOE AND ST. MARIES RIVERS, CITY OF ST. MARIES AND VICINITY, IDAHO.
Army Engineer District, Seattle, Wash. For primary bibliographic entry see Field 4A. W76-01370

SPECIAL FLOOD HAZARD REPORT: TO REVISE FLOOD PLAIN INFORMATION, METROPOLITAN REGION, DENVER, COLORADO; VOLUME II: SAND, TOLL GATE AND LOWER CHERRY CREEKS, SOUTH PLATTE RIVER BASIN.

Army Engineer District, Omaho, Nebr.

Ever primary bibliographic netwy see Field 4A For primary bibliographic entry see Field 4A. W76-01371

FLOOD PLAIN INFORMATION: PROCTORS CREEK, CHESTERFIELD COUNTY, VIR-GINIA. Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W76-01372

FLOOD PLAIN INFORMATION: SAN LORENZO RIVER, BOULDER CREEK-FEL-TON, SANTA CRUZ COUNTY, CALIFORNIA. Army Engineer District, San Francisco, Calif. For primary bibliographic entry see Field 4A. W76-01373

FLOOD PLAIN INFORMATION: APTOS, TROUT AND VALENCIA CREEKS, CITY OF APTOS, CALIFORNIA. Army Engineer District, San Francisco, Calif. For primary bibliographic entry see Field 4A. W76-01374

FLOOD FREQUENCY DISTRIBUTION IN A FLOOD FREQUENCY DISTRIBUTION IN A CATCHMENT SUBJECT TO TWO RAINFALL PRODUCING MECHANISMS, Queensland Irrigation and Water Supply Commission, Brisbane (Australia). Surface Water Resources Branch. For primary bibliographic entry see Field 2A. W76-01425

FLOOD WATER ANALYSIS IN THE AREA OF TIDAL RIVER EIDER (HOCHWASSERANALYSE IM RAUM DER BIN-

NENEDEER), E. Guevara-Perez, and U. Schendel. Wasserwirtschaft, Vol 65, No 7/8, p 190-193, 1975. 1 fig. 4 tab. 14 ref.

Descriptors: *Storm water, *Rivers, *Flood forecasting, Floods, Mathematical models, Precipitation(Atmospheric), Data collections, Tidal streams Identifiers: Seasonal variations

The probability of the occurrence of high water flows in the catchment area of the tidal river Eider (Schleswig-Holstein) was investigated by means of different distribution functions on the basis of obdistribution data collected over eleven years. Three distribution functions: log normal distribution according to Galton; log Pearson type III distribution; and gamma distribution were found suitable for the forecasting of flood events. The occurrence of high water flows in the summer period is primarily determined by the precipitation two days and one day before the flood event, as well as on and one day before the flood event, as well as on the day of the highest waters. The correlations between high water flow and the various parameters are less certain in the winter period, when high water flow is essentially influnced by the precipitation on the day preceding the event, by the water content of the ground, and by the precipitation on the day of the high water flow. (Takacs-FIRI.) W76-01428

PREDICTION OF THE EFFECTS OF THE FLOODWATER OF THE OLONA RIVER IN TICINO (PREVISIONI SUGLI EFFETTI DELLA IMMISSIONS DELLE ACQUE DI PIENE DELL' OLONA IN TICINO), For primary bibliographic entry see Field 4A.

LONG- AND SHORT-TERM FORECASTING OF RIVER DISCHARGE, (IN JAPANESE), For primary bibliographic entry see Field 4A. W76-01454

CALIFORNIA HIGH WATER, 1973-1974, California State Dept. of Water Resources, Sacramento. Div. of Resources Development. W. A. Arvola, J. S. Bartok, W. B. Chan, J. C. Bringham, and G. W. Patrick. Available from the Calif Dept of Water Resources, Sacramento, Calif, 95802 for \$3.00. Bulletin No 69-74, November 1974, 67 p. 23 fig. 2 tab, 3 append.

Descriptors: *Floods, *Flooding, *California, *Water year, *Storms, Storm runoff, Runoff, Rainfall, Weather patterns, Precipitation(Atmospheric), Streamflows, Flood stages, Hydrographs, Flood damage, Hydrology, Reservater Descriptors voirs, Drainage. Identifiers: High water events.

Water year 1973-74 in California was wet, especially in the northern part of the state. The wet season included two major storms that caused extensive flooding in several basins in the North Coastal Hydrographic Area, and in the Sacramen-to River basin of the Central Valley Hydrographic Area. The first major flooding occurred in mid-January 1974: the second occurred at the end of March 1974. The bulletin, 12th in an annual series of reports on high water events in California, presented information on flooded areas and stormpresented information on flooded areas and storm-related damage during the water year (October 1, 1973-September 30, 1974). It described the general weather patterns preceding and during significant storm periods, the precipitation characteristics of these storms, and the resulting runoff. Also included were tabulations of precipitation comparisons, peak streamflows and stages, hydrographs of stream stages and reservoir operations, weir overflow graphs, and a description of general weather natterns significant to storms affecting weather patterns significant to storms affecting California. (Robison-ISWS)

W76-01482

STILLWATER RIVER AND ROSEBUD CREEK FLOOD HAZARD ANALYSES, STILLWATER COUNTY, MONTANA.

Soil Conservation Service, Bozeman, Mont Report, May 1974. 132 p, 2 fig, 11 plates, 17 maps,

Descriptors: *Floods, *Flood frequency, *Flood recurrence interval, *Montana, Rivers, Streams, Streamflow, Maximum probable flood, Flood forecasting, Flood data, Maps, Flood protection, Flood control, Flood damage, Flood plains, Flood plain insurance, Flood profiles, Surface runoff, Design flood, Erosion, Sedimentation, Hydrology, Management.
Identifiers: *Stillwater River(Mont), *Rosebud Creek(Mont).

Flooding results in loss of property, creates health and safety hazards, and disrupts needed services. Flooding also results in high costs to welfare agencies and city, county, state, and federal govern-ments to repair or replace roads, streets, and bridges; rescue and care for the stranded; protect private property; clean up debris; and restore services. Knowledge of potential flood hazard, as presented in the report, is the basis of properly administering a flood plain management program to minimize these costs. The report contained sixteen aerial photomaps showing the 100-year frequency flood lines along a portion of the Stillwater River and Rosebud Creek. The photomaps also showed soils information. Water surface profiles, soils interpretations, flood photographs, and other related flood plain data were included. The 10-, 25-, 50-, 100-, and 500-year frequency floods were analyzed. Only the 100-year flood lines were shown on the aerial photomaps and water surface profiles. Information for the 10-, 25-, 50-, 100-, and 500-year floods was in an appendix. Elevations for other frequency storms can be determined from the basic support data on file with the Soil Conservation Service. (Sims-ISWS)

2F. Groundwater

SOURCES AND FATE OF 'AVAILABLE' NITROGEN IN RURAL ECOSYSTEMS. Wisconsin Univ., Madison. For primary bibliographic entry see Field 5B. W76-01031

PROCEDURES FOR THE OPTIMUM USE OF GEOPHYSICAL METHODS IN GROUND-WATER DEVELOPMENT PROGRAMS, Pretoria (Sou. Africa). National Physical Research

P. F. Worthington.

Bulletin of the Association of Engineering Geologists, Vol 12, No 1, p 23-38, 1975. 27 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Borehole geophysics, *Resistivity, *Geophysics, *Aquifer testing, Exploration, Subsurface mapping, Surveys, Aquifers, Ground-water, Groundwater basins, Water sources, Water wells, Groundwater resources, Groundwater mining, Overdraft, Groundwater movement, Permeability, Porosity, Rock properties, Transmissivity, Water quality.

An appraisal is made of the role of geophysics in An appraisal is made of the role of geophysics in groundwater exploration and development, and the pertinent geophysical techniques and different hydrologic regimes to which they may be usefully applied are described. First the water-transmitting properties of the aquifer should be established; these are defined as either granular, or fractured, fissured, jointed or cavernous. The laternal extent of the aquifer should then be delineated and promising areas for well yield are approximated

from observation well data. In mapping secondary aquifers the problem generally reduces to struc-tural mapping of the aquifer and adjacent forma-tions, whereas in hydrogeophysical mapping of primary aquifers the problem is one of delineating variations in those parameters which control groundwater quality and availability. Two poten-tial problems can occur once development of an aquifer has taken place: overpumping resulting in declining water levels, and contamination if saline intrusion or the influx of polluted waters is induced. Both problems can be monitored by geophysical methods. (Robinett-Arizona) W76-01125

GALERKIN FINITE-ELEMENT SIMULATION

OF A GEOTHERMAL RESERVOIR, Geological Survey, Reston, Va. For primary bibliographic entry see Field 1A. W76-01179

GEOHYDROLOGY AND WATER QUALITY OF THE MISSISSIPPI RIVER ALLUVIAL AQUIFER, NORTHEASTERN LOUISIANA, Geological Survey, Baton Rouge, La. M. S. Whitfield, Jr.

Louisiana Department of Public Works, Water Resources Technical Report No 10, 1975. 29 p. 4 fig. 8 plate, 1 tab, 19 ref.

*Groundwater Descriptors: *Hydrogeology, *Water quality, *Louisiana, *Mississippi River basin, Alluvial aquifers, Aquifer characteristics, Groundwater movement, Water wells, Well data, Pumping, Water yield, Transmissivity, Hydraulic conductivity, Storage coefficient, Groundwater recharge, Water supply, Chemical analysis.
Identifiers: *Northeastern Louisiana.

The Mississippi River alluvial aquifer in northeastern Louisiana is in the alluvium of the Mississippi, Arkansas, and Quachita Rivers and underlies approximately 5,000 sq mi in the Mississippi River valley. The aquifer, of Pleistocene age, is a southeastward-thickening wedge of sand and gravel that ranges in thickness from about 20 to 135 feet. Fine sand, silt, and clay of Holocene age overlie and generally confine the aquifer. These fine-grained deposits range in thickness from 0 to 100 feet but generally do not exceed 40 feet. Water levels in the aquifer generally are less than 30 feet below land surface. The aquifer can yield water in sufficient quantity for most uses. The transmissivity ranges from 13,000 to 45,000 feet squared per day. The hydraulic conductivity ranges from 130 to 530 feet per day. Storage coefficients range from 0.001 to 0.05. Large-diameter wells yield as much as 7,000 gpm near Tallulah in Madison Parish. The quality of water varies areally and with depth, but generally the water is hard to very hard and high in iron concentration. Where fresh, the water typically is a calcium bicarbonate type generally ranging in hardness from 200 to 600 mg/litre. (Woodard-USGS) W76-01180

HYDROGEOLOGY ALONG THE PROPOSED BARRIER-RECHARGE-WELL ALINEMENT IN SOUTHERN NASSAU COU ISLAND, NEW YORK, Geological Survey, Mineola, N. Y. COUNTY. For primary bibliographic entry see Field 4B. W76-01184

LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA: PART 1.CHANGES IN THE HYDROLOGIC EN-VIRONMENT CONDUCTIVE TO SUBSIDENCE, Geological Survey, Reston, Va. For primary bibliographic entry see Field 4B. W76-01192

Group 2F-Groundwater

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: I. SEASONAL FLUCTUATIONS IN THE HEIGHT OF THE GROUND WATER TABLE, for Agricultural Research, (Nigeria).

J. Kowal, and A. O. Omolokun. Samaru Res Bull. 149 p, 27-40. 1972. Illus.

Descriptors: *Watershed(Basins), Hydrology, Water table, Rainfall, Groundwater, *Seasonal, *Fluctuations.

Identifiers: Catchment basins, Nigeria, Production, Rainfall, Samaru, Seasonal, Small, Soil, Storage, Table, Water, Zaria, Nigeria.

Fluctuations of the water-table in a small catchment area at Samaru, Zaria, were studied. The water-table of the catchment basin occurs at various depths in relation to topography but can be described in terms of gradients in respect to topographical slope or a convenient horizontal datum (e. g., lake surface of full capacity). The dry season water-table occurs at a relatively shallow depth. The gradient of the dry season water-table restricts the water storage capacity of the soil profile, and in wet years not all the rainfall can be accepted. There is a considerable surplus of rainfall over evapo-transpiration demands lasting from July till the end of rains in Oct., resulting in the rise of water-table gradients. The rise in the dry season water table occurs when cumulative rainfall is about 18 in., which is usually in July. During wet years 40% of the catchment area has a water table at less than 5 ft depth when the rains end, and this may adversely affect crop production. With the present cropping patterns and the prevailing soil and climatic conditions, water conservation measures such as tired ridges cannot benefit crop production. The amount of ground water tem porarily stored in the soil profile above the dry season water table and lost in seepage is between 10-14% of the total water budget of the catchment basin .-- Copyright (c) 1974, Biological Abstracts, Inc.

UNDERGROUND STORAGE OF TREATED WATER: A FIELD TEST

W76-01230

C.G. Smith, Jr., and J. S. Hanor. Ground Water Vol 13, No 5, p 410-417, September-October 1975. 4 fig, 2 tab, 12 ref.

Descriptors: *Groundwater, *Water sources, *Water supply, *Underground storage, *Water *Louisiana, Unconsolidated aquifers, storage. Groundwater movement, Recharge, Supply, Wells, Pumped storage, Storage capacity, Water demand, Water shortage, Injection, On-site tests, Model studies, Sand aquifers, Injection wells.

Identifiers: "Injection-storage-production process, "Treated water storage, "Recovery efficiency, Groundwater quality, Marine sands, Deltaic sands

Successful underground storage of large volumes of treated water (sufficient for a period of weeks or months) could provide a temporary, alternative water supply in areas where potable groundwater is not available and where surface runoff varies unpredictably in quantity and quality. A smallscale field test of underground storage, using an injection well, was performed in Jefferson Parish, Louisiana. Storage in the tested aquifer was impractical due to the pre-existing groundwater movement rate of 0.5 ft per day. A mathematical model of the injection-storage-production process accurately predicted the recovery efficiencies ob served in the two tests. The quantity of injected water was not adversely affected by geochemical reactions occurring during the tests. The injected water was softened during storage by ion-exchange reactions between injected water and clay particles in the aquifer. (Sanderson-ISWS) W76-01253 BACTERIAL FLORA OF SALINE AQUIFERS. North Carolina State Univ., Raleigh. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.

WATER RESOURCES OF VOLCANIC ISLANDS, A PILOT PROJECT IN THE CANA-RIES, For primary bibliographic entry see Field 2A. W76-01258

W76-01268

LIMITATIONS OF THE ELECTRICAL RE-SISTIVITY METHOD IN LANDFILL IN-VESTIGATIONS, For primary bibliographic entry see Field 5B.

HYDROGEOLOGY OF A PORTION OF THE SAND HILLS AND OGALLALA AQUIFER, SOUTH DAKOTA AND NEBRASKA,

South Dakota School of Mines and Technology.

P. H. Rahn, and H. A. Paul. Ground Water, Vol 13, No 5, p 428-437, September-October 1975. 10 fig, 2 tab, 15 ref.

Descriptors: *Hydrogeology, *Groundwater, *Aquifer testing, *Water table aquifers, *South Dakota, *Nebraska, *Groundwater recharge, Water quality, Recharge, Aquifer characteristics, Unsteady flow, Transmissivity, Hydraulic constitution, Nebural recharge, *Stance, captificiant, *Stance, *Configuration**. ductivity, Natural recharge, Storage coefficient, Drawdown, Water yield. Identifiers: *Ogallala aquifer, Delayed yield, Type curve analysis, Well testing.

The Pliocene Ogallala Formation and the Quater-nary Sand Hills Formation cover an extensive area in the northcentral prairie states. The area studied in this investigation included onlt that portion between the Little White River, South Dakota, and the Niobrara River, Nebraska, where the saturated thickness is about 100 feet. A five-day aquifer test showed that the coefficient of permeability is 439 gpd/sq ft. The water had total dissolved solids contents of only 90 ppm. An average of 18 inches of precipitation falls on this arid country annually, and the average annual recharge to these permeable deposits was calculated at 2 to 3 inches. Little groundwater development has occurred in the area to date, but the aquifer has considerable potential. The aquifer is exceptionally permeable, close to the surface, and easy to drill, and has exceptionally good recharge and good quality water. Data on recharge rates and theoretical distance-drawdown curves supported the con-clusion that irrigation of more than 1 quarter-section for every 2 sections of land would cause a depletion of the aquifer. (Pricket-ISWS) W76-01299

STEP-DRAWDOWN TEST ANALYSIS BY COM-PUTER.

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B. W76-01300

2G. Water In Soils

STEADY INFILTRATION FROM LINE SOURCES BURIED IN SOIL, Department of Agriculture, Watkinsville. For primary bibliographic entry see Field 3F. W76-01065

SENSING TECHNIQUES EVALUATION OF SOIL WATER CONDITIONS, South Dakota State Univ., Brookings. Remote Sensing Inst. For primary bibliographic entry see Field 7B.

W76-01067

SOIL SALINITY DISTRIBUTION IN SPRIN-KLER AND SUBSURFACE-IRRIGATED AND CITRUS.

Brigham Young Univ., Provo, Utah. For primary bibliographic entry see Field 4B. W76-01074

THE EFFECT OF SOIL WATER SUPPLY ON CORN FERTILIZER RESPONSE.

Agricultural Research Service, Morris, Minnesota. For primary bibliographic entry see Field 3F. W76-01075

ELECTROLYTE WATER TEXAS A and M Univ., College Station.
M. A. Rahman, E. A. Hiler, and J. R. Runkles.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 1, p 129-132, January-February 1974. 7 fig, 2 tab, 11 ref.

Descriptors: *Infiltration, *Infiltration rates, *Hydraulic conductivity, Electrolytes, Soil investigations, Soil management, Soil physical properties. Soil treatment, Soil water movement, Permeability, Agriculture, Analysis, Reclamation, Alkaline soils

Identifiers: *Soil reclamation.

Reclamation processes in a slowly permeable, mildly sodic, low electrolyte, humid soil were studied using different ionic compositions and concentrations of electrolyte waters. The method utilized for this soil consisted of increasing soil hydraulic conductivity with additions in increasing concentration of electrolyte water and then leaching out salts with decreasing concentrations while maintaining the increased hydraulic conductivity. Electrolyte waters applied in increasing followed by decreasing concentrations were utilized successfully for reclaiming this soil. The soil intake rates and hydraulic conductivities were increased very substantially. Further applied research and field trials with similar soils seem justified based on the findings. (Skogerboe-Colorado State) W76-01077

SOIL TEMPERATURE MODELING USING AIR TEMPERATURE AS A DRIVING MECHANISM, Wyoming Univ., Laramie. Dept. of Civil Engineer-

For primary bibliographic entry see Field 7B. W76-01079

MODELING INFILTRATION AND REDISTRIBUTION OF SOIL WATER DURING INTERMITTENT APPLICATIONS,
Minnesota Univ., St. Paul. Dept. of Agricultural

Engineering. L. G. James, and C. L. Larson.

Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois Paper No 74-2571 Amer-ican Society of Agricultural Engineers, St. Joseph, Michigan. 26 p. 17 fig. 2 tab, 22 ref.

Descriptors: *Model studies, *Computer models, *Infiltration, Soil water, Soil water movement, Wetting, Infiltration rates, Capillary action, Ru-noff, Irrigation, *Forecasting.

A model based on equations that use measured physical parameters to represent the infiltration and redistribution of soil water during intermittent water applications with reasonable simplicity and accuracy is needed. A computer model combining the work of other researchers was developed to fulfill this need. Inputs required by the model include the soil's saturated conductivity and moisture content, its approximate conductivity-

moisture content and conductivity-capillary pressure relationships, its initial moisture content as well as the distance from the soils' surface to its lower boundary. Model output includes the depths and moisture contents of both primary and secondary wetting fronts, the rates of infiltration, surdary wetting fronts, the rates of infiltration, surface and subsurface supply as well as the total volume of water applied, infiltrated and supplied to surface and subsurface runoff. Experimental laboratory data for a graded silica sand was collected and compared to model predictions. Results presented indicate that the model does an excellent job of predicting the volume of water stored in the soil zone as well as the times when surface and subsurface runoff begin. It also gives excellent predictions of infiltration rate and surface and subsurface runoff supply rates when the application rate is less than or equal to the soils' saturated conductivity. (Skogerboe-Colorado State) W76-01085

SOIL WATER.

Agricultural Research Service, Columbia, Mo. North Central Region. C. R. Amerman, A. Klute, R. W. Skaggs, and R. E.

Reviews of Geophysics and Space Physics, Vol 13, No 3, p 451-454, 496-504, July, 1975, 556 ref.

Descriptors: *Soil water, *Soil water movement, *Unsaturated flow, *Hydraulic properties, *Hydraulic conductivity, Drainage effects, Infination, Leaching, Soil physics, Moisture tension, Permeability, Soil types, Storage capcity, Moisture, Porosity, Soil moisture, Soil physical properties, Soil properties, Flow, Saturated flow, Measurement, Equations, Bibliographies. Identifiers: Soil hydraulic properties.

Recent advances in developing methods to solve the equations governing combined saturated-un-saturated flow in 2 and 3 dimensions have focused attention on the need to determine effective field values of the hydraulic properties of the soil. Work done in this field to determine the field variability of soil hydraulic properties and to test various field methods of measuring these properties is discussed. Subjects include: methods for calculating the hydraulic conductivity from the soil water characteristics, thermal and osmotic effects on soil water movement, and transport equations of nitrogen movement during leaching of unsaturated soils. (Robinett-Arizona) W76-01111

THE EFFECT OF TEXTURE STRATIFICATION ON SALT ACCUMULATION IN AN ARID LAND

Arizona Univ., Tucson. Dept. of Soils, Water and Engineering. For primary bibliographic entry see Field 2K. W76-01112

THE UTILITY OF SURFACE TEMPERATURE MEASUREMENTS FOR THE REMOTE SENSING OF SURFACE SOIL WATER STATUS, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab ater Conservation Lab. S. B. Idso, T. J. Schmugge, R. D. Jackson, and R.

J. Reginato. Journal of Geophysical Research, Vol 80, No 21, p 3044-1049, July, 1975. 8 fig, 9 ref.

Descriptors: *Soil temperature, *Soil surfaces, *Soil moisture, *Remote sensing, Moisture ten-sion, Arizona, Topsoil, Soil physics, Soil water, Semiarid climates, Moisture content, Soil physical properties, Thermal properties, Air temperature, Diurnal, Soil types.

Experiments on Avondale loam soil indicate that remote sensing of surface soil temperature may provide a practical means of assessing soil water status in the uppermost few centimeters of bare soil. The volumetric water contents of surface soil layers between 2 and 4 cm thick were found to be linear functions of the amplitude of the diurnal surface soil temperature wave for clear day-night periods and also linear functions of the daily maxmum value of the surface soil-air temperature differential. If the soil type is unknown, water content per se cannot be determined, but fair estimates of soil water pressure potential can be obtained. (Robinett-Arizona) W76-01121

EFFECT OF SULFURIC ACID ON WATER MOVEMENT IN CALCAREOUS SOILS, Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3B.

PERCOLATION TESTS FOR SEPTIC TANK SUITABILITY OF TYPICAL SOUTHERN ARIZONA SOILS, Arizona Univ., Tucson. Dept. of Soils, Water and

Engineering. K. A. Barbarick.

Master of Science Thesis, 1975, 72 p. 12 fig. 7 tab. 2 append. 41 ref.

Descriptors: *Percolation, *Septic tanks, *Sewage disposal, *Soil disposal fields, *Pervious soils, Arizona, Percolating water, Penetration, Porosity, Seepage, Soil types, Silts, Clay, Permeability, Infiltration, Soil water movement, Mathematical studies, Model studies, Flow rates, Flow measure-

The percolation rates of nine typical southern Arizona soils were measured and found to vary from 1.75 to 21.5 cm/hr. Use of linear regression demonstrated a significant linear relationship between the test hole diameter and percolation rate, and correlation was found to exist between the percent of sand and clay in the subsoil and precolation rate. The percent of silt in the subsoil was also a factor in rate determination. A technique utilizing existing mathematical theories to simulate flow from cylindrical holes or absorption trenches in order to relate percolation rate to actual flow rates in absorption trenches was established but need improvement. Mathematical modeling does, however, provide potential for comparing percolation rates to expected flow rates. (McLachlau-Arizona) W76-01128

CONTAINMENT AREA FACILITY CONCEPTS FOR DREDGED MATERIAL SEPARATION, DRYING, AND REHANDLING, Hittman Associates, Inc., Columbia, Md.

C. W. Mallory, and M. A. Nawrocki.

Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-002 605, \$9.00 in paper copy, \$2.25 in microfiche. Oct. 31, 1974. 236 p, 57 fig, 58 tab, 2 append.

Descriptors: *Dredging, *Sands, *Gravels, Reclamation, Spoil banks, Water pollution sources, Construction materials, Costs, Solid wastes, Bottom sampling, Desilting, Sludge disposal, Separation techniques, Soil engineering, Soil mechanics.

The separation of sand and gravel from dredged material is technically feasible using commercially available equipment employed by the sand and gravel and mineral processing industries. In most cases the cost of removing and processong the sand and gravel will be within the market value of materials normally produced. The removal of the sand and gravel will also reduce the required land area and storage volume of containment basins. (Witt-IPC) W76-01220

SOIL WATER DEPLETION BY LODGEPOLE PINE ON GLACIAL TILL.

Intermountain Forest and Range Experiment Station, Ogden, Utah. R. S. Johnston.

USDA Forest Service, Research Note INT-199, August, 1975. 8 p, 3 fig, 1 tab, 8 ref.

Descriptors: *Soil water, *Glacial soils, *Lodgepole pine trees, Clear-cutting, Water yield, Watershed management, Water resources, Groundwater availability. Identifiers: Pinus contorta, Utah, Uinta Moun-

Soil water depletion was measured on small paired plots of cut and uncut Pinus contorta. Neutron measurements were made to a depth of 3 m on two different soils of glacial origin. Soils on the cut plot contained from 3 to 11 cm more water than the adjacent uncut plot at the end of each summer after cutting. These changes in soil water were restricted to the surface 2 m of soil. The treatment effect should persist for several years, until deeprooted vegetation is completely re-established on the site. (Witt-IPC) W76-01221

MECHANICAL SNAKE RIVER UNDISTURBED

SOIL CORE SAMPLER, Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center For primary bibliographic entry see Field 7B. W76-01272

ANALYTICAL SOLUTIONS TO THE ONE-DIMENSIONAL LINEARIZED MOISTURE FLOW EQUATION FOR ARBITRARY INPUT, Arizona Univ., Tucson. Dept. of Soils, Water and

Engineering.

Soil Science, Vol 120, No 2, p 79-84, August 1975. 2 fig, 2 tab, 12 ref, append.

Descriptors: *Equations, *Soil moisture, *Mathematical models, Infiltration, Percolation, Soil water movement, Diffusivity, Hydraulic conductivity, Gravitational water, Moisture content, Numerical analysis, Loam, Clay loam, Earthwater interfaces. Identifiers: Linearized solution.

Analytical solutions to the one-dimensional, linearized moisture flow equation were presented. The surface boundary condition was taken either as a time-varying flux, time-varying water content, or with the flux as a linear function of the water content. A semi-infinite, vertical flow medium was considered with arbitrary initial conditions. Calculations for a cyclic flux input were compared to the associated nonlinear, finite difference solution for five simulations using data from two soils. The same general profiles were obtained. The solution was believed to have narticular merit to describe moisture regimes resulting from a high frequency irrigation schedule. (Visocky-ISWS) W76-01301

SIMULATION OF EVAPORATION FROM BARE SOIL UNDER STEADY AND DIURNALLY FLUCTUATING EVAPORATIVITY, Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences and Texas Agricultural Extension Service (Callege Statio tension Service, College Station.
For primary bibliographic entry see Field 2D. W76-01302

TWO-DEMINSIONAL TRANSPORT OF SOLUTES DURING NONSTEADY INFILTRA-TION FROM A TRICKLE SOURCE, Volcani Inst. of Agricultural Research, Bet Dagan (Israel).

Group 2G-Water In Soils

Soil Science Society of America Proceedings, Vol 39, No 4, p 604-613, July-August 1975. 3 fig, 15 ref, 1 append

Descriptors: *Solutes, *Unsteady flow, *Diffusion, *Convection, *Infiltration, Mathematical models, Numerical analysis, Equations, Unsaturated flow, Salinity, Root zone, Darcys law, Soil moisture, Moisture content, Soil watedr movement, Soils, Loam, Sands, Evaporation. Identifiers: *Plane flow, *Axisymmetric flow,

A simulation model for analyzing multidimensional simultaneous transfer of a noninteracting solute and water, applicable to infiltration from a trickle source, was developed. The equations describing transient two-demensional transport of a solute by diffusion and convection in unsaturated porous media were solved numerically by an approach that eliminated the effect of numerical dispersion. The noniterative alternating-directionimplicit finite difference procedure was used. Two mathematical models were considered: (1) a plane flow model involving the Cartesian coordinates x and z, and (2) an axisymmetric flow model described by the cylindrical coordinates r and z. An example of transport in a homogeneous, isotropic and stable sand and loam soil systems isotropic and stable said and roam son systems was given. Results were shown for typical cases of trickle infiltration to demonstrate the effects of trickle discharge and soil-hydraulic properties on the pattern of salt distribution in the wetted soil zone. The numerical results showed that the approach presented may be useful in analyzing two-demensional solute transport processes in soils. (Visocky-ISWS) W76-01303

TRANSFORMATIONS OF SWINE WASTE-WATER IN LABORATORY SOIL PROFILES. North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering. For primary bibliographic entry see Field 5B. W76-01387

CONTACT MATERIALS FOR LABORATORY

SOIL WATER STUDIES, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils. D. S. McIntyre, and C. L. Watson. CSIRO Australia, Division of Soils Technical Paper No. 26, 1975. 11 p. 3 fig. 10 ref.

Descriptors: *Laboratory tests, *Soil moisture, *Moisture tension, Soil water movement, Soil structure, Soil surfaces, Moisture content, Measurement, Soil physical properties. Identifiers: Suction plates, Pressure plates.

When wetting or draining structured soil material, particularly clods, on suction and pressure plates, interposal of a fine-grained material between sam-ple and plate can be used to increase the efficiency of contact and hence the rate of transfer of water. The particle size range best suited to any given applied suction may be approximately determined using a theory of packing. It is found in most cases that material with a particle size range lying within the silt and fine sand fraction should suffice. Various materials - grinding powders, glass beads, diatomaceous earth and soil separates - were tested for moisture retention at suctions up to 10 bars. Overall the most readily prepared suitable material of those tested is a soil containing a high percentage of very stable aggregates in the size range 5 to 76 micrometers. At suctions less than 0.20 bar, diatomaceous earth is the most suitable of the materials tested. (CSIRO)

SIMULATION OF THE RAINFALL-RUNOFF PROCESS USING A HYSTERETIC INFILTRA-TION-REDISTRIBUTION MODEL, New South Wales Univ., Kensington (Australia). School of Civil Engineering.

For primary bibliographic entry see Field 2A. W76-01421

GEOMORPHOLOGY OF A GLACIATED FIRST-ORDER VALLEY IN SOUTH CENTRAL Cornell Univ., Ithaca, N.Y. Dept. of Agronomy. For primary bibliographic entry see Field 2J.

W76-01469

A HYDROPHOBIC MEMBRANE PROBE FOR TOTAL PRESSURE AND PARTIAL PRESSURE MEASUREMENTS IN THE SOIL AT-MOSPHERE,

Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie: H. Fluhler, and H. P. Laser.

Soil Science, Vol 120, No 2, p 85-91, August 1975. 8 fig. 13 ref.

Descriptors: *Soil environment, *Soil moisture, *Pressure measuring instruments, *Infiltration, Soil investigations, Soil water movement, Atmospheric pressure, Diffusion, Pore pressure, Measurement, Simulated rainfall, Instrumenta-tion, Pressure, Aeration, Air, On-site investiga-

Identifiers: *Soil atmosphere, *Hydrophobic membrane probe, Oxygen partial pressure, Soil aeration, Total air pressure.

For total air pressure and oxygen partial pressure measurements a hydrophobic membrane probe was used. The probe consisted of a small mem-brane-covered chamber and two teflon capillaries. The probe represented an artificial, permanently air-filled pore which connects the soil atmosphere at a certain depth with a pressure transducer or an oxygen electrode placed on the soil surface. The soil water was excluded from the artificial gas phase by a water-repellent membrane highly permeable to air. The hydrophobic membrane made the gaseous phase between soil and sensor continuous. This instrument was used in the field to follow changes in total air pressure and oxygen partial pressure in the soil atmosphere during water infiltration and drainage processes. The total pressure in the soil atmosphere and the partial pressure of its components strongly depend upon the continuity of the gaseous phase. This effect was shown in an undisturbed soil profile after a heavy artificial rainfall of 75 mm was applied with 2 hr. (Sanderson-ISWS) W76-01480

2H. Lakes

WATER QUALITY AND PHYTOPLANKTON PRODUCTIVITY OF SUMMERSVILLE RESER-VOIR

West Virginia Univ., Morgantown, Dept. of Biolo-

For primary bibliographic entry see Field 5C. W76-01143

PHYTOPLANKTON COMPOSITION SMALL SUBARCTIC LAKE IN NORTHWEST TERRITORIES, CANADA, Toronto Univ. (Ontario). Dept. of Botany. For primary bibliographic entry see Field 5C. W76-01157

GEOGRAPHY AND LAKE MORPHOMETRY OF THE AQUACULTURE STUDY AREAIN THE ERICKSON-ELPHINSTONE DISTRICT (SOUTHWESTERN MANITOBA, Fisheries and Marine Service, Ottawa (Ontario).

. A. Sunde, and J. Barica.

Canada Fisheries and Marine Service, Research and Development Directorate Technical Report, No 510, 1975. 38 p. 5 fig, 8 tab, 13 ref, 1 append.

*Geomorphology, *Climatic data, *Aquiculture, Fish farming, Canada, Shallow water, Land use, Precipitation(Atmospheric), Water temperature, Aquatic plants, Hydrologic aspects, Eutrophication, Winterkilling, Vegetation, Bathymetry, Potholes, Cold regions. Identifiers: Dist (Manitoba)

A systematic investigation was made of these shallow pothole lakes to determine their feasibility for commercial production of rainbow trout. The area is an undulating glacial till plain with underlying cretaceous shale of the Riding Mountain formation. Soils are 70% grey-black and 20% greywooded. Mean annual temperature is 1C with 85wooded. Mean annual reneprature is 12 with 30 mm, snowfall 1140-1270 mm, potential evapotranspiration 525-550 mm, and mean moisture deficit about 100 mm. Grain and cattle are the principal resource bases. The land is 52% cultivated. Population density is about 3.5 peo-ple/sq km. Depressions between knolls and ridges are filled with marshes, sloughs, and pothole lakes. Because of the hummocky terrain and porous nature of unconsolidated glacial drift, surface drainage is local. Many lakes are landlocked with no surface inflow or outflow, very eutrophic, productive, shallow, and unstratified. Most winterkill and thus contain few native fish. Since 1968, 71 lakes have been experimentally stocked with rainbow trout with encouraging results. The lakes' area and depth frequency distribution is described. Bathymetric charts of 16 lakes are presented. These lakes are representative of hundreds of thousands of similar winterkill lakes in the Canadian prairies that are potentially suitable for fish farming. (Buchanan-Davidson--Wisconsin) W76-01166

NUTRIENT AND PHYTOPLANKTON STUDIES OF LLANGORSE LAKE, A EUTROPHIC LAKE IN THE BRECON BEACONS NATIONAL PARK.

Trent Univ., Peterborough (Ontario). Dept. of Biology. For primary bibliographic entry see Field 5C. W76-01167

CHANGE IN PLANKTONIC COMPLEXES IN THE EUTROPHIC LAKE BALTYM DUE TO OVERGROWTH BY WEED,

Ural and Siberian Fishery Scientific-Research and Planning Inst. Sverdlovsk (USSR). For primary bibliographic entry see Field 5C. W76-01172

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. XII. NUMBERS AND BIOMASS OF THE FAUNA AS-SOCIATED WITH MACROPHYTES,

Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.

E. Pieczynski. Ekologia Polska, Vol 21, No 88, p 597-609, 1973. 4 fig, 5 tab, 50 ref.

Descriptors: *Fish stocking, *Grazing, *Aquatic plants, *Fish food organisms, Benthic fauna, Dipgroupings, Oligochaetes, Plant groupings, Animal groupings, Oligochaetes, Mayflies.

Identifiers: *Lake Warniak(Poland), Elodea canadensis, Stratiotes aloides.

Studies were made in Poland to estimate the food resources of the vegetation zone for fish and to study the effects of fish grazing on the invertebrate fauna associated with macrophytes. The number, biomass, and composition of fauna associated with two species of macrophytes found in distinctly monospecific aggregations were analyzed. More fauna were found on Elodea canadensis (water-weed) that on Stratiotes aloides (water-soldier), but the biomass of fauna and

Lakes-Group 2H

number of components was lower. Numbers of Chironomidae, Oligochaeta, and Ephemeroptera and the biomass of Chironomidae and Ephemeroptera were high on Elodea. Numbers of Chironomidae and the biomass of Chironomidae. Chirohomidae and the commass of chirohomidae, Hirudinea, and Lepidoptera were high on Stratiotes. Numbers and biomass were lower in comparison to the control portion of the lake which had an increased fish stock. Decreases in Chironomidae biomass were greater than changes in numbers; similar changes were observed in other fauna groups which could be used as fish food. Individual chironomids were lighter in the stocked part of the lake. These results appeared to be caused by fish grazing. (Buchanan-Davidson--Wisconsin) W76-01174

SURFACE SUPPLY OF THE UNITED STATES, 1966-70: PART 3. OHIO RIVER BASIN-VOLUME 3. OHIO RIVER BASIN FROM LOUISVILLE, KENTUCKY, TO WABASH RIVER.

Geological Survey, Reston, Va. For primary bibliographic entry see Field 2E.

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 1.' NORTH ATLANTIC SLOPE BASINS--VOLUME 1. BASINS FROM MAINE TO CONNECTICUT. Geological Survey, Reston, Va.

For primary bibliographic entry see Field 2E. W76-01178

HEAVY-METAL TOLERANCE IN ALGAE FROM CONTAMINATED LAKES NEAR SUD-BURY, ONTARIO,

Toronto Univ. (Ontario). Dept. of Botany For primary bibliographic entry see Field 5C. W76-01197

STUDIES ON THE DECOMPOSITION OF A DUCKWEED (LAMNACEAE) COMMUNITY, Allegheny Coll., Meadville, Pa. Dept. of Biology. For primary bibliographic entry see Field 5C. W76-01198

A STUDY OF THE OZARK HELLBENDER CRYPTOBRANCHUS ALLEGANIENSIS BISHOPI,

Milwaukee Public Museum, Wis. Vertebrate Div. M. A. Nickerson, and C. E. Mays. Ecology. Vol 54, No 5, p 1164-1165. 1973. Illus.

Descriptors: *Salamanders, Animal populations, Biomass, Density. Identifiers: Cryptobranchus Alleganiensis.

A tag-recapture study of the Ozark Hellbender salamander, C. alleganiensis bishopi, was made on the North Fork of the White River, Ozark Co., Missouri (USA). During the summers of 1969 and 1970, animals were tagged along a 2.67-km stretch of stream bed. Population estimates were 428 with 95% confidence level (CL) of 341-573 hellbenders/km of stream bed. Biomass estimates were 156 kg/km with 95% CL of 124.5-210 kg/km of stream bed. Density in 'prime habitat' was 1/8-10 m2 (with a 95% confidence interval of 1/6-7 m2-1/13-16 m2). Recaptures indicated little movement. Ozark Hellbenders are one of the dominant organ-Biological Abstracts, Inc.

W76-01199

THE ALGAL MICROFLORA OF A STRING MIRE IN RELATION TO THE CHEMICAL COMPOSITION OF WATER,

Lund Univ. (Sweden). Dept. of Ecological Botany. For primary bibliographic entry see Field 5C. W76-01200

THE HYDROLOGY OF GLACIERS, British Columbia Univ., Vancouver. Dept. of

Geology.
For primary bibliographic entry see Field 2C.
W76-01246

MEASUREMENTS OF WIND-DRIVEN FLOW PROFILES IN THE TOP MILLIMETER OF

WATER, National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
W. McLeish, and G. E. Putland.

Journal of Physical Oceanography, Vol 5, No 3, p 516-518, July 1975. 3 fig, 13 ref.

Descriptors: *Boundary layers, *Viscosity, *Heat transfer, *Winds, *Laboratory tests, Interfaces, Velocity, Shear, Laminar flow, Turbulent flow, Surfaces, Measurements.
Identifiers: *Radiometric measurements, Velocity

profiles.

Radiometric measurements have demonstrated the existence of a conductive sublayer in laboratory experiments at moderate air speeds. The viscous sublayer in water is thicker than the conductive sublayer. Information on the thickness of these sublavers at a water surface is necessary to measure ocean temperature and heat flow radiometrically. Profiles of velocity in the top millimeter of water in a wind-water tunnel were measured from cine photographs of clouds of microscopic hydrogen bubble tracers. The depth interval of 0.005 cm between measurements provided several velocity readings within the depth region in which a linear viscous sublayer might be expected. The linear portion of the velocity profile at the surface represented a viscous sublayer, which was thinner than that at a solid boundary with the same stress. This was believed to represent the first direct measurement of a viscous sublayer at a water surface. The viscous sublayer supports the previous evidence for a conductive sublayer sufficiently thick for radiometric heat flow measurements with moderate wind speeds. (Singh-ISWS) W76-01260

INVENTORY OF POTENTIAL AND EXISTING UPSTREAM RESERVOIR SITES, TAUNTON AND NARRAGANSETT BAY STUDY AREAS. Soil Conservation Service, Amherst, Mass For primary bibliographic entry see Field 7C. W76-01269

CHEMISTRY OF MUN-WATER INTERFACE IN AN IMPOUNDMENT,

Illinois State Water Survey, Peoria. Water Quality Section. For primary bibliographic entry see Field 2K. W76-01304

EVALUATION OF SEDIMENT TRAP METHODOLOGY,

Toronto Univ., Ontario (Canada), Dept. of Zooloor primary bibliographic entry see Field 2J.

SEDIMENTATION IN LAKE LEMON, MON-ROE COUNTY, INDIANA, Indiana State Dept. of Natural Resources,

Bloomington. For primary bibliographic entry see Field 2J. W76-01314

LAND-CAPABILITY CLASSIFICATION OF THE LAKE TAHOE BASIN, CALIFORNIA-NEVADA, A GUIDE FOR PLANNING, Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Statio For primary bibliographic entry see Field 4A. W76-01346

DECISION TO CONTROL EUTROPHICATION, Canada Centre for Inland Waters. Burlington (Ontario) For primary bibliographic entry see Field 5G. W76-01352

MANAGEMENT OF THE INTERNATIONAL GREAT LAKES, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 6E.

REGULATION OF GREAT LAKES WATER LEVELS, A SUMMARY REPORT, 1974. International Joint Commission-United States and Canada, Great Lakes Levels Board. For primary bibliographic entry see Field 4A. W76-01395

UPTAKE AND MIGRATION OF TRACERS IN

LAKE SEDIMENTS, Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.

A. Lerman, and T. A. Lietzke.

Limnology and Oceanography, Vol 20, No 4, p 497-510, July 1975. 5 fig. 3 tab, 33 ref.

Descriptors: *Great Lakes, *Radioisotopes, *Adsorption, *Sediments, *Mathematical models, *Lake Erie, *Lake Ontario, Sedimentation, *Tracers, Diffusion, Flow, Equations, Pore water, Chemical reactions, Strontium, Cesium, *Path of pollutants. Identifiers: Chemical balance, Uptake.

Mathematical solutions were given for an equation describing transient and steady state concentrations in lake water and sediments with adsorption, decay, sedimentation, and diffusion. The results were compared with the distributions of two tracers, Sr90 and Cs137, in the sediments of Lakes Erie and Ontario. Experimental data supported the treatment of adsorption of the tracers by sediment particles as a linear exchange reaction. Sr90 was adsorbed less strongly than Cs137 by the sedi-ments. This accounted for the greater depth of Sr90 occurrence in lake sediments. Distribution of the radionuclide activities in sediments was compatible with a model based on mean steady input to the lakes for 16 years and these values of diffusion coefficients in the pore water: for Sr90, 0.000002 to 0.0000004 sq cm/sec; and for Cs137, 0.00002 sq cm/sec. Another transport mechanism in sediments, sedimentation, was more significant in Lake Erie than in Lake Ontario. Conditions were outlined under which the fluxes from lake water to sediments would be important in the chemical balance of medium and large lakes. (Adams-ISWS) W76-01475

A SIMPLE DIFFUSION MODEL OF THE MEAN A SIMPLE DISTRIBUTION OF SOLUBLE MATERI-ALS IN THE GREAT LAKES, Canada Centre for Inland Waters, Burlington,

(Ontario). For primary bibliographic entry see Field 5B. W76-01476

POTENTIAL TEMPERATURES IN DEEP FRESHWATER LAKES,

Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences. D. M. Farmer.

Limnology and Oceanography, Vol 20, No 4, p 634-635, July 1975. 1 fig, 1 tab, 6 ref.

Descriptors: *Thermocline, *Freshwater, *Lakes, Water temperature, Deep water, Stability, Density, Temperature, Limnology, Canada.
Identifiers: *Adiabatic effects, *Dimictic lakes, *Lake Baikal(Canada).

Group 2H-Lakes

Attention was drawn to the implications of adiabatic effects when examining the static stability of fresh water lakes. Although adiabatic effects are known to be small in lakes, especially near the temperature of maximum density, there is clearly a need to know just how small they are. A method was presented for finding potential temperatures in deep dimictic lakes. Though the adiabatic effect is very small it may be significant in special appli-cations. (Lardner-ISWS) W76-01477

CHARACTERIZATION OF SLUSH ICE IN THE

GREAT LAKES, Coast Guard Research and Development Center,

Groton, Conn. For primary bibliographic entry see Field 2C. W76-01487

SIMULTANEOUS PROCESS-RESPONSE STUDY ON THE EAST AND WEST COASTS OF LAKE

MICHIGAN, University of South Florida, Tampa For primary bibliographic entry see Field 2J. W76-01494

WATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA - LAKE ERIE, VOLUME 1 - SYNTHESIS, Cleaveland Dept. of Public Utilities, Ohio. Div. of

Utilities Engineering. For primary bibliographic entry see Field 5B.

2I. Water In Plants

W76-01500

SENSING TECHNIQUES FOR EVALUATION OF SOIL WATER CONDITIONS, South Dakota State Univ., Brookings. Remote Sensing Inst.

For primary bibliographic entry see Field 7B.

HIGH RATE SPRINKLING OF A LOW INTAKE

Agricultural Research Service, Brawley, Calif. For primary bibliographic entry see Field 3F. W76-01069

ANHYDROUS AMMONIA APPLICATION IN IRRIGATION WATER VS. MECHANICAL AND ITS EFFECT ON CORN YIELDS,

Nebraska Univ., Dept. of Agricultural Engineer-

For primary bibliographic entry see Field 3F. W76-01072

ALTERNATE-FURROW IRRIGATION OF FINE TEXTURED SOILS, Southwestern Great Plains Research Center.

Bushland, Tex. For primary bibliographic entry see Field 3F. W76-01073

THE EFFECT OF SOIL WATER SUPPLY ON CORN FERTILIZER RESPONSE.

Agricultural Research Service, Morris, Minnesota. For primary bibliographic entry see Field 3F.

IRRIGATION TIMING BY THE STRESS DAY

INDEX METHOD, Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-01082

EFFECTS OF INUNDATION PERIOD ON SEEDLING GROWTH,
Texas A and M Univ., College Station. Dept. of

Agricultural Engineering. For primary bibliographic entry see Field 4A. W76-01084

ACID CHANGES IN EPIDERMIS OF VICIA FABA AND THEIR IM-PLICATION IN STOMATAL MOVEMENT. Agricultural Research Service, Watkinsville, Ga. J. E. Pallas, Jr., and B. G. Wright. Plant Physiol, Vol 51, No 3, p 588-590, 1973.

Descriptors: *Stomata, Organic acids, Plant physiology, Epidermis. Identifiers: Vicia faba.

Considerable evidence indicates that the increase in guard cell turgor resulting in stomatal opening is brought about by active K+ uptake into guard cells. Only a small increase in inorganic anions appears to accompany the increase in K+. A plausible explanation is that organic acids are produced within guard cells and act as counterions, whereas the H+ produced are exchanged for K+. This hypothesis was tested by using different levels of ambient CO2 in light to control stomatal aperture and at the same time measure changes in organic acid production in the epidermis of V. faba. Epidermal strips were used, quickly frozen in liquid nitrogen, and later extracted. A positive correlation was found between stomatal resistance (r sub s, indirect measure of stomatal aperture) and CO2 level. With decreases in r sub s, total titratable acidity increased. The organic acids, glyceric, malic, and citric, in the epidermis, as measured by gas chromatography of trimethylsilyl derivatives, increased. Changes in glucose or sucrose were not found. These analyses provided evidence that organic acid production in the epidermis is associated with stomatal opening.--Copyright 1973, Biological Abstracts, Inc. W76-01107

RELATIONSHIPS BETWEEN LEAF WATER STATUS, ABSCISIC ACID LEVELS, AND STO-MATAL RESISTANCE IN MAIZE AND SORGHUM,

Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiolo-

gy Div. M. F. Beardsell, and D. Cohen. Plant Physiology, Vol 56, No 2, p 207-212, August, 1975. 7 fig, 1 tab, 30 ref.

Descriptors: *Plant growth, *Plant physiology, *Moisture stress, *Stomata, *Drought tolerance, Water requirements, Soil-water-plant relation-ships, Irrigation effects, Moisture deficit, Nutrient requirements, Osmotic pressure, Water balance, Turgidity, Corn(Field), Sorghum, Transpiration. Identifiers: "Water potential, "Stomatal diffusion resistance, "Abscisic acid levels, Maize(Zea mays L. var. Wisconsin 575), Sorghum(Sorghum bicolor, hybrid NK145).

Water potentials, stomatal diffusion resistance, and abscisic acid levels were measured in the leaves of maize (Zea mays L. var. Wisconsin 575) and sorghum (Sorghum bicolor, hybrid NK145) plants subjected to a drought-recovery cycle under controlled environmental conditions. Over a narrow range of water potential (-8 to -10 bars), abscisic acid levels began to rise and the stomata closed. Abscisic acid levels continued to rise after the stomata closed. The maximum amount of abscisic acid extracted from maize leaves was about twice that from sorghum, and represented a similar proportional increase over the control level. It is concluded that stress response patterns in maize and sorghum are similar. Stomatal diffusion resistance and abscisic acid rise at slightly lower levels of leaf water potential in sorghum, which also appears to recover more rapidly upon rewatering. A lag of at least 60 minutes before an

increase in abscisic acid level can be detected in maize indicates that a redistribution of en-dogenous abscisic acid rather than synthesis may be involved in the initial closure of stomata. Impaired stomatal functioning after stress does not appear to be associated with high residual levels of abscisic acid in the leaf. (Robinett-Arizona)

UPTAKE AND TRANSLOCATION OF AM-MONIA BY FRESHWATER HYDROPHYTES, Oklahoma State Univ., Stillwater. Dept. of Zoolo-

Ecology, Vol 55, No 1, p 199-201, 1974.

Descriptors: *Aquatic plants, *Ammonia, Translo-Identifiers: Ceratophyllum demersum, Elodea densa. Scirpus.

Elodea densa roots absorbed 15NH4 and trans-located it to the apical tissues, while Scirpus sp. did not. Submerged leaves and stems of Ceratophyllum demersum also transported 15NH4 to the apices.—Copyright 1974, Biological Abstracts, Inc. W76-01161

EFFECT OF MOISTURE STRESS ON RED MAPLE SEEDLINGS FROM DIFFERENT SEED SOURCES

Agricultural Research Service, Delaware, Ohio. Shade Tree Ornamental Plants Lab. For primary bibliographic entry see Field 2D. W76-01196

CONTRIBUTION TO THE TAXONOMY AND ECOLOGY OF FRESH-WATER MOLLUSKS IN STREAMS OF CENTRAL SPAIN, (IN SPANISH), Junta de Energia Nuclear, Madrid (Spain). Laboratorio de Radioecology. G. De Los Santos, and A. Perez-Minguez. Bol R Soc Esp Hist Nat Secc Biol. Vol 69, No 2, p 125-149, 1971. Illus., English summary.

Descriptors: *Gastropods, *Mollusks, Habitats, Rivers, *Ecology, *Systematics.
Identifiers: *Bivalves, Spain, Taxonomy, Tajo

Six species of bivalves and eleven of gastropods of some localities of the Tajo river (Spain) were studied ecologically and systematically. In each of the habitats, their ecological characteristics were determined.--Copyright 1974, Biological stracts. Inc.

2J. Erosion and Sedimentation

NO.THLIAGE SYSTEM REDUCES EROSION FROM CONTINUOUS CORN WATERSHEDS, Agricultural Research Service, Coshocton, Ohio.

L. L. Harrold, and W. M. Edwards. Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 3, p 414-416, May-June 1974. 2 fig, 4 tab, 7 ref.

Descriptors: *Soil erosion, *Corn, Crop response, Crop production, Farm management, Climatic data, Rainfall-runoff relationships, Agriculture, Erosion, Erosion control, Erosion rates, Sediment transport Identifiers: No-tillage management.

Soil erosion from seven large events on the two watersheds in the same conventional rotation corn in the 1941-1969 period were sufficiently comparable to form a base on which to judge the effectiveness of the no-tillage system in the 1970-1973 period. Data for the period of identical treatment show little or no effect of land slope differences-

Erosion and Sedimentation—Group 2J

12.7% and 5.8%. In the period of continuous corn, 1970-1973, erosion from the conventional tillage corn watershed remained high, while that from the no-tillage corn system decreased sharply. In 1973, differences in soil erosion were striking. Photographs taken after the July 10, 1973 event show signs of large amounts of sediment movement from the conventional tillage corn watershed. There was no evidence of sediment movement from the continuous corn watershed in the no-til-lage system. (Skogerboe-Colorado State) W76-01078

SEDIMENT YIELD FROM SOUTHWEST IDAHO RANGELAND WATERSHEDS, Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.

C. W. Johnson, G. R. Stephenson, C. L. Hanson, R. L. Engleman, and C. D. Engelbert.

Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. Paper No 74-2505, American Society of Agricultural Engineers, St. Joseph, Michigan. 17 p, 6 fig, 7 tab, 15 ref.

*Sediment yield, *Watersheds(Basins), Watershed management, Runoff, Stream erosion.

Information collected shows that a small percentage of yearly runoff produces most of the yearly sediment and that major floods occur during the winter. Contrary to what is normally observed, sediment concentrations and yearly sediment yield increased with watershed size. Stream bank erosion seemed to be the main source of sediment on the largest watersheds and 'channel flushing' caused high sediment concentrations. (Skogerboe-Colorado State)

THE GEOCHEMISTRY OF SEDIMENTS FROM THE NORTHERN REYKJANES RIDGE AND THE ICELAND - FAROES RIDGE, Texas A and M Univ., College Station. Dept. and

Oceanography; and Texas A and M Univ., College Station. Coll. of Geosciences.

For primary bibliographic entry see Field 2K. W76-01097

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POSTDEPOSITIONAL INJECTIONS OF URANI-UM-RICH SOLUTIONS INTO EAST PACIFIC RISE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric

Science. Miami, Fla. For primary bibliographic entry see Field 8E. W76-01098

A NOTE ON THE EFFECT OF CHEMICAL TREATMENTS IN THE MINERALOGICAL

STUDIES OF SEDIMENTS, McGill Univ., Montreal (Quebec), Marine Sciences Centre For primary bibliographic entry see Field 5A.

W76-01109

NUTRIENT AND SEDIMENT DISCHARGE FROM AGRICULTURAL WATERSHEDS IN

OKLAHOMA, Agricultural Research Service, Durant, Okla. Water Quality Management Lab. For primary bibliographic entry see Field 2A. W76-01116

FLOATABLE BREAKWATER, For primary bibliographic entry see Field 8B. W76-01130

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 2. SOUTH AT-

ANTIC SLOPE AND EASTERN GULF OF A study of surficial deposits in the Piedmont MEXICO BASINS. Geological Survey, Reston, Va.

For primary bibliographic entry see Field 2K. W76-01176

MAP SHOWING FLOOD OF APRIL 1975 AT EAST LANSING, MICHIGAN, Geological Survey, Lansing, Mich. For primary bibliographic entry see Field 2E. W76-01188

MAP SHOWING FLOOD OF APRIL 1975, LANSING, MICHIGAN, Geological Survey, Lansing, Mich.

For primary bibliographic entry see Field 2E. W76-01189

MEANDERING OF SUPRAGLACIAL MELT

Alberta Univ., Edmonton. Dept. of Civil Engineer-For primary bibliographic entry see Field 2E. W76-01261

DEPOSITIONAL ENVIRONMENT IN. TERPRETATION FROM SETTLING-VELOCITY (PSI) DISTRIBUTIONS, California Univ., Los Angeles, Dept. of Geology. W. E. Reed, R. Le Fever, and G. J. Moir. Geological Society of American Bulletin, Vol 86, No 9, p 1321-1328, September 1975. 8 fig, 3 tab, 41

Descriptors: *Sedimentary petrology, *Settling velocity, Sediments, Deposition(Sediments), Beaches, Dunes, Rivers, Sands, Fluvial sedi-Hydraulics, Fluid mechanics. Hydrodynamics, Density, Particle size, Sampling, Laboratory tests, Sieve analysis, Numerical analy-

Identifiers: *Sand textures, Multivariate discriminant-function analysis, Fluvial sands, Settling

Multivariate discriminant-function analysis of settling-velocity (Psi) distributions of sands provides a reliable technique for environmental interpretation. Nearly complete environmental separation was achieved by this computational procedure using settling-velocity parameters for 81 samples of sand from desert dune, fluvial, and beach environments. The curve shape of sieved grain-size distributions plotted on probability paper does not appear to be a reliable guide for interpreting depositional environments. Comparison with settling-tube data indicates that sieving may distinguish grain-size distributions unrelated to the hydraulic characteristics of sediments and may not distinguish hydraulically important modalities. (Lee-ISWS) W76-01265

EFFECTS OF AGRICULTURE ON EROSION AND SEDIMENTATION IN THE PIEDMONT PROVINCE, MARYLAND, Denver Univ., Colo. Dept. of Geography.

J. E. Costa. Geological Society of America Bulletin, Vol 86, No 9, p 1281-1286, September 1975. 5 fig, 2 tab, 41

Descriptors: *Erosion. *Sedimentation. *Deposition(Sediments), *Maryland. *Agriculture, Soil erosion, Sediment transport, Sediment load, Sediment discharge, Land use, Flood plains, Sediment yield, Reservoir silting,

Hydrology. Identifiers: *Sediment balance equation, Piedmont watershed, Sheetwash deposits, Stream-channel response, Reservoir sedimentation rate. province of Maryland has made it possible to con-struct a balance equation of sediment production and deposition since erosive agricultural land use began in the 1700s. Truncated Piedmont upland soil profiles imply approximately 0.15 m of soil erosion. Reservoir sedimentation rates imply that 34% of the eroded sediment has been carried out of the system. The rest of the sediment remains in the watershed as alluvium in the upper 1 m of flood plains and as colluvium and sheetwash deposits on hillslopes. Agricultural sediment stored in flood plains constitutes 14% of the estimated soil erosion. The sediment was deposited mostly by overbank deposition at rates as high as 1.6 cm/yr. The remaining 52% of the eroded sediment occurs as colluvium and sheetwash deposits on hillslopes and as fan-shaped colluvial-alluvial deposits at junctures of headwater tributaries. Wood from such deposits was radiocarbon dated at 290 plus or minus 100 yr. A buried junk pile in a flood plain yielded license plates whose dates imply that after 1925 the dump was buried by over-bank deposits at rates as high as those for a basin undergoing urbanization. Piedmont basins less than 26 sq km have statistically longer bankfull recurrence intervals than streams with drainage area greater than 25 sq km. This suggests that since the decline of agricultural land use in the early 1900s, small upland tributaries have adjusted to decreased sediment loads. (Lee-ISWS)

SPECIAL SOLUTIONS FOR NONLINEAR ERO-SION PROBLEMS, Minnesota Univ., Minneapolis, School of Mathe-

matics. I C Luke

Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-001 360, \$3.25 in paper copy, \$2.25 in microfiche. Journal of Geophysical Research, Vol 79, No 26, p 4035-4040, September 10, 1974. 6 fig, 19 ref, 1 ap-pend. ONR N-00014-67-A-0094-0014.

Descriptors: *Erosion, *Sediment transport, *Weathering, *Model studies, Geomorphology, Streamflow, Soil formation, Sedimentation, Sediments, Sediment load, Suspended solids, Mathematical models, Flow, Fluid mechanics, Land

A nonlinear system of differential equations was set up to describe evolution of landforms, and several previous models of weathering phenomena and sediment transport were found to follow as limiting cases. It was shown that an unexpectedly large class of nonlinear wavelike solutions can be obtained by the method of characteristics in cer-tain cases. The geometry of the wave fronts was found by means of a Legendre transformation; this was equivalent to the study of solutions of constant form. The method was applied to a specific curved surface as an example, and the results were illustrated in several diagrams. Finally, a nonlinear stream formation problems was considered. (Sims-ISWS) W76-01296

MULTIPLE OFFSHORE BARS AND STANDING WAVES.

Louisiana State Univ., Baton Rouge. Coastal Stu-For primary bibliographic entry see Field 2L. W76-01298

SOIL EROSION ON SELECTED HIGH CLAY SUBSIOLS.

Agricultural Research Service, Oxford, Miss. Sedimentation Lab. M. J. M. Romkens, D. W. Nelson, and C. B. Roth.

Journal of Soil and Water Conservation, Vol 30, No 4, p 173-176, July-August 1975. 2 fig, 3 tab, 8

Group 2J-Erosion and Sedimentation

Descriptors: *Erosion, *Soil erosion, *Clays, Subsoil, Erosion rates, Simulated rainfall, Soil surfaces, Soil profiles, Soil properties, Construction, Erosion control, Soil management, On-site in-

vestigations.
Identifiers: *Construction site erosion, Soil erodibility. High clay subsoil, Soil loss,

Soil erosion rates on six high clay subsoils were measured during a series of simulated rainstorms Soil erodibility factors computed for both tilled and scalped surface conditions differed ap-preciably from the K values predicted by the soil erodibility nomograph. K values for tilled subsoils were consistently smaller and those from scalped subsoils generally higher than the nomograph-predicted values. Deviations were attributed to the effects of aggregate size and stability. Scalped surface conditions were recommended as standards for evaluating subsoil erodibility. A soil management factor was used to describe soil erosion from other than scalped surfaces. (Lee-ISWS) W76-01308

USE OF ERTS-1 IMAGERY TO INTERPRET THE WIND EROSION NEBRASKA'S SANDHILLS, HAZARD Nebraska Univ., Lincoln. Conservation and Sur-

vev Div. P. M. Seevers, D. T. Lewis, and J. V. Drew.

Journal of Soil and Water Conservation, Vol 30, No 4, p 181-183, July-August 1975. 4 fig, 8 ref.

Descriptors: *Winds, *Erosion, *Nebraska, *Remote sensing, Soils, Ranges, Satellites(Artificial), Sands, Soil erosion, Mapping, Land resources, Erosion rates, Range management, Vegetation.

Identifiers: *Wind erosion, *ERTS, Sandhills(Neb), Multispectral scanner.

Images from the Earth Resources Technology Satellite (ERTS-1) were interpreted for mapping areas in the Nebraska Sandhills where wind ero sion had been severe and blowouts had formed and for mapping vegetative cover on rangeland to pinpoint places where future wind erosion was likely. Using images from May 1973 in the visible red wave length (MSS band 5), it was possible to construct maps showing blowout distribution. It was also possible, using the same images and a densitometer, to map areas where the range is in poor condition and vegetative cover so low that wind erosion is likely to occur. These maps will be useful in pinpointing areas in the Sandhills where range management practices need to be improved. (Lee-ISWS) W76-01309

SEDIMENTATION OF ORGANIC MATTER IN ST. MARGARET'S BAY, NOVA SCOTIA

Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab

For primary bibliographic entry see Field 2L. W76-01311

EVALUATION OF SEDIMENT TRAP METHODOLOGY,

Toronto Univ., Ontario (Canada), Dept. of Zoolo-

W. B. Kirchner.

Limnology and Oceanography, Vol 20, No 4, p 657-660. July 1975. 5 tab. 12 ref.

Descriptors: *Sediment sorting, *Instrumentation, *Lakes, *Sediments, *Canada, Lake sediments, Suspended solids, Suspendion, Limnology, Turbulence, Tubidity, Secchi disk, Thermal stratification, Sedimentation, Measurement, On-site in-

vestigations, Sampling, Trap efficiency.
Identifiers: *Sediment traps, *Catching efficiency,
*Crawford Lake(Canada), Trap size, Sediment collecting period.

Five sediment traps with collecting areas ranging from 8 to 1465 sq cm collected the same amount of material, as measured by dry weight, ash weight, and phosphorous content, on a unit area basis. Variances from different size traps were not significantly different. These results were presented as further illustration that traps are a meaningful technique for measuring sedimentation in certain lakes. (Lee-ISWS) W76-01313

SEDIMENTATION IN LAKE LEMON, MON-ROE COUNTY, INDIANA, Indiana State Dept. of Natural Resources,

Bloomington.

E. J. Hartke, and J. R. Hill.

For sale by Indiana Geological Survey, Bloomington, Indiana, 47401, for \$1.00. Geological Survey Occasional Paper 9, 1974. 18 p, 14 fig, 4 tab, 4 ref.

Descriptors: *Lake sediments, *Storage capacity, *Sedimentation, *Suspended solids, *Indiana, Sampling, Hydrology, Lakes, Sedimentation rates, Sustained yield, Analysis, Sediments.
Identifiers: *Lake Lemon(Ind), Sediment samples.

The watershed hydrology, collection of sedimentation and water quality data, and analyses of these collected data were described for Lake Lemon, Monroe County, Indiana. Future sedi-mentation rate was predicted. The sedimentation rate in Lake Lemon was shown to be low, equal to 0.17% per year. The water in the lake had murky brown color with a vertical visibility of 6 to 12 inches in sunlight. Suspended sediment concentration near the surface was equal to 0.8 to 7.2 mg/l. The lake lost only 3.4% of the total capacity due to low sedimentation rate. With a present annual sedimentation rate of 0.17% it was estimated that the capacity of the lake would be reduced by half in about 290 years. (Bhowmik-ISWS) W76-01314

MORPHOLOGY OF AN ARCTIC RIVER BAR

Louisiana State Univ., Baton Rouge. Center for Wetlands Resources; and Louisiana State Univ., Baton Rouge. Coastal Studies Inst. For primary bibliographic entry see Field 2C. W76-01319

MASS MOVEMENT OF MISSISSIPPI RIVER

DELTA SEDIMENTS, Louisiana State Univ., Baton Rouge. Coastal Stu-For primary bibliographic entry see Field 2L.

W76-01322

THE INTERACTION OF FLUID AND SEDI-MENT ON THE FORESHORE,

Chicago Univ., Ill. Dept. of Geophysical Sciences; and Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.

For primary bibliographic entry see Field 2L. W76-01326

GEOMORPHOLOGY OF A GLACIATED FIRST-ORDER VALLEY IN SOUTH CENTRAL

Cornell Univ., Ithaca, N.Y. Dept. of Agronomy L. A. Daugherty, W. E. Hanna, and R. W. Arnold. Soil Science Society of America Proceedings, Vol 39, No 4, p 710-716, July-August 1975. 6 fig, 2 tab,

Descriptors: *Soils, *Geomorphology, Valleys, Watersheds(Basins), Glaciation, Solifluction, Terraces(Geologic), Stratigraphy, Soil profiles, Soil surveys, Soil types, Erosion, Deposition(Sediments).

Identifiers: *Soil mapping, Periglacial, Congelitrubate, Soil morphology, Hillslope, Valley bottom.

A glaciated first-order valley in south central New York was studied to determine the post-glacial evolution of the landforms. Ninety-seven profiles were sampled at depth intervals of approximately 30 cm to determine internal features of the land-scape units. Particle size difference were the main indicators of lithologic discontinuities. Arithmetic mean of the fine earth particle size in conjunction with the relative amounts and orientation of coarse fragments were useful in determining strata of the summit, shoulder, backslope, footslope, toeslope and the high, intermediate, and low level terraces. Congeliturbate as much as 10 m deep was found in the basin at the head of the stream in foot- and toeslope areas. The downstream portion of these deposits has been deeply entrenched by the stream. During periglacial times congeliturbate in the downstream channel contributed to temporary base levels of the stream. Much of this congelitur-bate remains as terraces. The alluvium resulting from the entrenchment of the congeliturbate occurs as a series of 92 terrace remnants. It is believed that their strata, relative elevation, and gradient contain clues to the complex sequence of erosional and depositional events. (Lee-ISWS)

TURBULENCE MEASUREMENT OF A FLOW WITH SUSPENDED SOLID PARTICLES, Gifu Univ., (Japan). Dept. of Civil Engineering. For primary bibliographic entry see Field 8B. W76-01470

SEDIMENT ROUTING FOR AGRICULTURAL

WATERSHEDS, Agricultural Research Service, Temple, Tex. For primary bibliographic entry see Field 4D. W76-01471

UPTAKE AND MIGRATION OF TRACERS IN LAKE SEDIMENTS,

Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences. For primary bibliographic entry see Field 2H. W76-01475

SIMULTANEOUS PROCESS-RESPONSE STUDY ON THE EAST AND WEST COASTS OF LAKE

University of South Florida, Tampa. R. A. Davis, Jr., and W. T. Fox. Available from the National Technical Information Service, Springfield, Va 22161 as AD-A005 647, \$4.50 in paper copy, \$2.25 in microfiche. Technical Report No 13, December 1974, 61 p, 28 fig, 1 tab, 23 ref, 2 append. ONR 388-092/10-18-68(414). ONR N00014-69-C-0151.

Descriptors: *Lake Michigan, *Waves(Water), *Erosion, *Sedimentation, Lakes, Sedimentary structures, Weather, Winds, Data collections, Onsite investigations, Beaches, Shores, Beach erosion, Geomorphology, Currents(Water), Limnology.

A 15-day time-series study was conducted simultaneously on both the east and west sides of Lake Michigan during the summer of 1974. Sites at Zion, Illinois, and South Haven, Michigan, were investigated following the same procedures used during previous Lake Michigan studies. Primary objective of the study was to determine the nature of process-response activities as a single weather system moves offshore and onshore as its crosses the lake. Only one low pressure system passed over the study area during the period of investiga-tion. Observed patterns in the weather, waves, and currents were quite similar at both sites and were similar to patterns from previous studies. In general, energy was higher on the east side (onshore) as compared to the west side (offshore). The low intensity of the passing weather systm was reflected in the small amount of change to the beach and nearshore morphology. Increasing ener-

Chemical Processes—Group 2K

gy caused erosion to the strand area and deposi-tion in the plunge zone. During maximum energy conditions the plunge zone was eroded and deposition took place on the foreshore. Changes in processes and the topographic responses occurred simultaneously on both sides of the lake, at least within the limits of sampling intervals. (Sims-ISWS) W76-01494

COASTAL PROCESSES AND SEDIMENTATION ON THE NEW ENGLAND COAST, Massachusetts Univ., Amherst. For primary bibliographic entry see Field 2L.

2K. Chemical Processes

THE GEOCHEMISTRY OF SEDIMENTS FROM THE NORTHERN REYKJAMES RIDGE AND THE ICELAND - FAROES RIDGE,
Texas A and M Univ., College Station. Dept. and

Oceanography; and Texas A and M Univ., College Station. Coll. of Geosciences.

A. Horowitz. Marine Geology, Vol 17, No 2, p 103-122, Sept, 1974, 4 fig, 3 tab, 46 ref.

Descriptors: *Analytical techniques, *Volcanoes, *Heavy metals, *Mineralogy, *Sedimentology, *Geochemistry, *Seismic studies, *Lead, *Iron, *Manganese, Copper, Chromium, Zinc. Identifiers: *Geographical regions, Geochemical partition studies, Bulk chemical analyses, Iceland,

Atomic absorption spectroscopy, X-ray diffraction, *Lithium.

Samples from active Reykjanes Ridge and the inactive Iceland - Faroes Ridge have been investigated sedimentologically, mineralogically, and geochemically. The sediments display polymodal grain-size distributions and are poorly sorted, indicating deposition by various mechanisms and contributions from numerous sources. The mineralogy strongly reflects the large input of volcanic ash and ice rafted material. Bulk chemical analyses indicate the Reykjanes Ridge sediments appear to be enriched in Fe, Mn, Cu, Cr, and Zn as has been reported for other active ridges. Faroes Ridge in Iceland does not show this enrichment. Partition studies indicate that enriched Fe and Mn ore are held in separate phases while the other metals are present in all phases. Adsorption are not in major concentrating mechanism for the enhanced elements. Li distributions are apparently unaffected by active ridges and Pb seems to be partially concentrated biologically. There are indications that other criteria must be used in conjunction with bulk chemical analyses, in order to establish the presence of active ridge metal contributions. (Kemp-Vanderbilt) W76-01097

OXIDATION OF CINNABAR BY FE (III) IN ACID MINE WATERS,

Stanford Univ., Calif. Dept. of Civil Engineering. J. E. Burkstaller, P. L. McCarty, and G. A. Parks. Environmental Science and Technology, Vol 9, No 7, p 676-678, July, 1975. 4 fig. 4 ref.

Descriptors: *Heavy metals, *Mercury, *Iron, *Pollutants, *Oxidation, Mine water, Chlorine, Hydrogen ion concentration, Spectrophotometry, Solubility, Water pollution, Chemical properties, Isotope studies, Mining.

Identifiers: *Cinnabar, *Soluble mercury,

*Chemical binding, *Isotopic dilution, *Oxidation rate, New Almaden Mine.

d

A laboratory study was set up to determine the rate of oxidation of cinnabar (HgS) by Fe (III) and the release of mercury to solution under conditions prevalent in acid mine drainage waters. Results show that under certain conditions significant mercury was released to solution. This occured when both Fe (III) and C1(-) were present in solution at environmental levels with a low pH. However, when a large amount of cinnabar was present, most of the mercury released to solution became bound to the cinnabar by an unknown mechanism. For this reason the amount of dis solved mercury was much lower than expected given the high rate of oxidation of cinnabar. An isotopic dilution method was used to calculate the total mercury, both in solution and bound to the remaining cinnabar, released by oxidation. Total iron and soluble mercury were measured by atomic absorption. Chloride was measured by argentometric and mercuric nitrate methods. (Davis-Vanderbilt)

A NOTE ON THE EFFECT OF CHEMICAL TREATMENTS IN THE MINERALOGICAL STUDIES OF SEDIMENTS,

McGill Univ., Montreal (Quebec). Marine Sciences Centre For primary bibliographic entry see Field 5A. W76-01109

THE EFFECT OF TEXTURE STRATIFICATION ON SALT ACCUMULATION IN AN ARID LAND

Arizona Univ., Tucson. Dept. of Soils, Water and Engineering. A. K. Abbass.

Master of Science Thesis, 1974. 53 p, 12 fig, 9 tab,

Descriptors: *Groundwater movement, *Saline soils, *Saline water, *Soil profiles, *Stratification, Groundwater, Soils, Soil properties, Salinity, Soil structure, Sands, Arid lands, Clays, Irrigation ef-

A laboratory soil-column experiment was conducted to study the effect of saline groundwater and soil stratification on salt distribution in soil profiles under fallow condition. In general, the column surfaces of the stratified soils were significantly higher in salt than the homogenous sand and clay soils, due to the upward movement of saline groundwater through the soil column and evaporation at or near the surface. The major ions con-tributing to the surface salts were Na+, Ca++, and Cl-. The salt in the clay soil columns was higher in Ca++ concentrations and lower in Na+ than in the sandy soil. (McLachlan-Arizona) W76-01112

TOTAL ALKALINITY AND HARDNESS OF SURFACE WATERS IN ALABAMA AND MIS-SISSIPPI.

Auburn Univ., Ala. Dept. of Fisheries and Allied

Advacultures.

C. E. Boyd, and W. W. Walley.

Alabama Agricultural Experiment Station, Bulletin 456, March 1975. 16 p, 4 fig, 6 tab, 28 ref.

Descriptors: *Alkalinity, *Hardness(Water), *Productivity, *Alabama, *Mississippi, Ponds, Streams, Surveys, Geomorphology, Fish harvest.

Studies of small ponds and streams from major physiographic divisions of Alabama and Mississippi showed that total alkalinity was closely related pi showed that total alkalinity was closely related to the nature of surface and subsurface geologic formations. Stream waters generally had higher total alkalinity and total hardness than pond waters. During low flow, streams consisted primarily of ground water which was normally concentrated in ions than runoff. Ponds were usually filled by direct precipitation and runoff thus contained lower ionic concentrations. There was usually a high correlation between total al-kalinity and total hardness, which were derived from solutions of calcium and magnesium carbonates in most physiographic areas. When total hardness greatly exceeded total alkalinity, sulfate

ions were more abundant. Sodium and potassium sons were more adundant. Sodium and potassium were associated with alkalinity anions, where al-kalinity greatly exceeded hardness. Calcium was more abundant than magnesium in all waters. Cor-relations between total hardness and calcium hardness were high for all waters. Correlations between alkalinity and productivity were related to differences in phosphorus and nitrogen concentrations rather than alkalinity. Phytoplankton growth in ponds with low total alkalinity or hardness may be limited by low carbon dioxide or bicarbonate and calcium and should be limed to increase carbon availability for photosynthesis, supply calcium to enhance fish production. (Buchanan-Davidson-Wisconsin) W76-01144

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 2. SOUTH AT-LANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.

MEALCO BASINS. Geological Survey, Reston, Va. Supt. of Documents, GPO, Wash., D.C. 20402 Price \$4.35 (paper copy). Water-Supply Paper 2142, 1974. 625 p, 1 fig, 40 ref.

Descriptors: *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Southeast US, River basins, Atlantic Ocean, Gulf of Mexico, Basic data collections, Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, Virginia, Physical properties, Streamflow, Sampling, Sites. Identifiers: *South Atlantic Slope, *Eastern Gulf

of Mexico.

During the water year ending September 30, 1969, the Geological Survey maintained 152 stations on 103 streams in the South Atlantic slope and Eastern Gulf of Mexico basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 140 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 33 and daily at 55 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 8 stations during the year ending September 30, 1969. Sedi-ment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the completion period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time sam-ples were collected and computed from a stagedischarge relation or from a discharge measurement. (Woodard-USGS) W76-01176

GEOHYDROLOGY AND WATER QUALITY OF THE MISSISSIPPI RIVER ALLUVIAL AQUIFER, NORTHEASTERN LOUISIANA, Geological Survey, Baton Rouge, La. For primary bibliographic entry see Field 2F. W76-01180

IONIZATION OF WATER IN SEAWATER, Oregon State Univ., Corvallis School of Oceanography.
For primary bibliographic entry see Field 1A. W76-01239

CHEMISTRY OF MUN-WATER INTERFACE IN AN IMPOUNDMENT, Illinois State Water Survey, Peoria. Water Quality

Section. W.-C. Wang.

Group 2K—Chemical Processes

Water Resources Bulletin, Vol 11, No 4, p 666-675, August 1975. 7 fig, 21 ref.

Descriptors: *Mud-water interfaces. *Impoundments, *Water chemistry, *Chemical properties, *Sediment-water interfaces, *Illinois, Chemical analysis, Instrumentation, Sampling, Water properties, Water quality, Impounded Analytical techniques, Chemical stratification, Oxidation-reduction potential, Hydrogen ion concentration, Chemistry, Analysis, Interfaces, Model studies, Surface waters, On-site investigations, Biology, Temperature, Dissolved oxygen, Stratification, Seasonal, Nitrogen. Identifiers: Lake Evergreen(III), Water chemistry

changes, Six-Mile Creek(Ill), Chemical parame-

ters, Biological activity.

Lake Evergreen was investigated during the time of filling and thereafter for changes of water chemistry at the mud-water interface. The results showed that aging or maturing occurs at the nascent stage of the impoundment history. There are many factors affecting concentration of chemical constituents at the interface. Hydrologic changes such as wind and wave action or water circulation can influence all chemical parameters. Biological activity may involve changes in concentrations of silica, phosphate, alkalinity, pH, ammonium, Kjeldahl nitrogen, etc. An associated effect is the reduction of oxidation-reduction potential which in turn affects the concentration of manganese, etc. All these changes occur primarily in autumn. In late spring to summer, there are changes of nitrite and nitrate accompanied by changes in dissolved oxygen. A water chemistry model at the interface was illustrated. (Henley-W76-01304

2L. Estuaries

A NOTE ON THE EFFECT OF CHEMICAL TREATMENTS IN THE MINERALOGICAL TREATMENTS IN THE STUDIES OF SEDIMENTS. McGill Univ., Montreal (Quebec). Marine

Sciences Centre For primary bibliographic entry see Field 5A. W76-01109

BIOGEOCHEMISTRY OF MARSH GASES: EF-FECTS OF INORGANIC CONSTITUENTS OF MARSH PLANTS ON METHANE EVOLUTION; AND CARBOHYDRATE STABILITY PLANTS,

Delaware Univ., Newark. Coll. of Marine Studies. F. M. Swain, J. M. Bratt, and J. Sherman. Technical Report No 30, November 1974. 14 p, 2 fig. 2 tab. 11 ref.

Descriptors: *Evolution, *Marsh plants, *Methane, *Inorganic compounds, Marshes, Gases, Carbohydrates, Alcohols, Humus, Cellulose, Organic acids, Delaware, Microbial degradation.

Identifiers: Succulent plants, Distichlis

Inorganic components of several species of marsh plants were studied to determine how they relate to methane evolution. Salt-marsh plants showed a relationship between succulence and methane production. The most succulent plants such as Salicornia and Distichlis contributed to relatively low methane evolution Potassium chloride accumulation was high in both plants while sodium and magnesium concentrations were low. The total car-bohydrate, the cellulose content of plants cultivated for methane production, and the cellulose content of the supernatant water were studied. The cellulose content of the culture was reduced to traces after several weeks although methane was still produced in high concentrations. Methane-producing bacteria developed best on cellulose substrates, but continued to grow on other carbohydrates. An intermediate stage in the anaerobic digestion of organic matter is the formation of organic alcohols and acids and followed by conversion to methane and carbon dioxide. The degree to which organic acids, alcohols, and other carbohydrate degradation products remain in the environment or are used for further bacterial degradation should be studied in Delaware marshes as they may be important in food chains and may be seasonal. Evaporation of the products may be involved in aerosols that develop in coastal ons. (Buchanan-Davidson--Wisconsin)

SPECIES COMPOSITION, STANDING STOCK, AND NET PRIMARY PRODUCTION OF A SALT MARSH COMMUNITY IN MISSISSIPPI. Mississippi State Univ., Mississippi State. Dept. of

Zoology. B. C. Gabriel, and A. A. de la Cruz.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as COM.74-11816, \$3.50 in paper copy, \$2.25 in microfiche. Publication MSGP-73-020, June 1974, 8 p, 2 fig, 2 tab, 11 ref. (NOAA-74111308). Published in Chesapeake Science, Vol 15, No 2, p 72-77, 1974.

Descriptors: *Productivity, *Salt marshes, *Marsh plants, Standing crops, Mississippi, Biomass, Bulrushes, Vegetation, Plant growth, Varieties,

Estuaries, Harvesting.
Identifiers: St. Louis Bay Estuary(Miss), Juncus roemerianus, Spartina cynosuroides, Distichlis spicata, Scirpus americanus.

Increases in above ground biomass during the growing season of a vegetationally mixed marsh in St. Louis Bay Estuary, Mississippi, were used to estimate species composition, standing stock, and annual net production. Thirty-four species from eleven taxonomic families of marsh plants were identified. Needlerush Juncus roemerianus, giant cordgrass Spartina cynosuroides, bulrush Scirpus americanus, and salt grass Distichlis spicata were the dominants. The other thirty species occurred only occasionally and did not represent the entire flora of the estuary. Diversity was probably due to variation in salinity. Maximum biomass of alive, dead, and partially decayed plants were observed in July, August, and January, respectively; minimum biomass of alive plants was observed in January. Standing dead biomass was always about the same. Community annual net production esti-mated by harvest method was 1051 g dry wt or 5012 ash-free Kcal/sq m. Total biomass obtained by reharvesting previously clipped quadrats in various stages of regrowth revealed a seasonal pattern of growth rate with a maximum during late summer and a productivity estimation of 1108 g dry wt or 5541 ash-free Kcal/sq m. (Buchanan-Davidson--Wisconsin) W76-01164

SPARTINA PROPAGATION OF NIFLORA FOR SUBSTRATE STABILIZATION AND SALT MARSH DEVELOPMENT,

North Carolina State Univ., Raleigh. W. W. Woodhouse, E. D. Seneca, and S. W.

Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-002 55, \$6.75 in paper copy, \$2.25 in microfiche. Army Coastal Engineering Research Center TM-46, August 1974. 155 p, 61 fig, 44 tab, 43 ref. DACW72-70-C-0015, DACW72-72-C-0012.

Descriptors: *Marsh plants, *Planning management, *Spoil banks, *Intertidal areas, Vegetation establishment, Salt marshes, Nutrient requirements, Slope stabilization, North Carolina, Estua-

Identifiers: Spartina alterniflora.

Stabilization of dredged material in the intertidal zone by establishment of an estuarine marsh plant--Spartina alterniflora (smooth cordgrass)--are

described. Transplants were more vigorous than seedlings and survived on exposed sites at lower elevations. They should preferably be planted in April and May 0.9 m apart; but have limited growth for the first season. Seedlings and seeds are less tolerant of rigorous conditions and were usually only effective in upper one-half of eleva-tion range of S. alterniflora. Mature seeds stored at 2-3C in salt water and planted 100 viable seeds/sq m in the upper 1-3 cm of substrate grew rapidly and usually produced better cover than transplants in the first season. Selecting sites at proper eleva-tions for growth is critical. Stands resisted competition from invading plants in areas of high salinity and long periods of inundation. Variables negatively associated with yield were salinity, manganese, and sulfur, while phosphorus was positively associated with yield. Nitrogen and phosphorus fertilizers enhanced growth of transplants and seedlings artificially established on dredge spoil. Salt marshes may be important in recycling nutrients that might otherwise occur as pollutants. (Buchanan-Davidson--Wisconsin) W76-01169

HOLOCENE TRANSGRESSIONS AND REGRESSIONS ON THE ESSEX COAST, OUTER THAMES ESTUARY. Queen Mary Coll., London (England). Dept. of

Geology.
J. T. Greensmith, and E. V. Tucker.

Geol Mijnbouw. Vol 52, No 4, p 193-202. 1973.

Illine Identifiers: Chenier, Coasts, *Estuaries, *Fauna,

Formation, *Holocene transgressions, Marshes, Mollusks, Peat, Seams, *United Kingdom(Thames estuary), *Halocene regressions, Radiocarbon dating.

Faunal and lithological changes within the 34 m of Holocene sediments of the chenier plain suggest 6 episodes (I-VI) of marine transgression inter-spersed with 5 episodes of regression. Evidence presented for recognizing transgressions includes chenier formation, marsh retreat and vertical changes in fauna, involving brackish water and intertidal mollusks. Regressions are interpreted chiefly from geosols and peat seams. Radiocarbon dates indicate that the transgressive episodes II, III and V first affected the region at about 7500, 4000 and 1400 B. P., respectively. The most recent one (VI) probably commenced about 300 B. P. The dates of episodes I and IV can only be conjectured. Comparison with similar events globally as well as in the Low Countries suggests that eustatic changes in sea level have played a significant role in the Holocene history of the Outer Thames estuary.—Copyright 1974, Biological Abstracts, Inc W76-01193

BENTHIC FAUNA AND ZOOPLANKTON IN SOME POLLUTED SWEDISH ESTUARIES, Uppsala Univ. (Sweden). Inst. of Zoology For primary bibliographic entry see Field 5B. W76-01194

CALCULATIONS OF DIFFERENTIAL KINE-MATIC PROPERTIES FROM LAGRANGIAN OBSERVATIONS IN THE WESTERN CARIB-BEAN SEA.

National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.

R. Molinari, and A. D. Kirwan, Jr.

Journal of Physical Oceanography, Vol 5, No 3, p 483-491, July 1975. 9 fig, 9 ref. NSF AG-253.

Descriptors: *Ocean circulation, *Drift bottles, *Analytical techniques, Dynamics, Flow, Data processing, Remote sensing, Movement, Oceanography.

Identifiers: *Caribbean Sea, *Differential kineproperties, Divergence,

Stretching deformation rates, Lagrangian observa-

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Observations of the motions of drifter clusters were made in the western Caribbean Sea during the summer of 1971. By two independent analyses the summer of 1971. By two independent analyses of the relative motions of a cluster, two time series of horizontal divergence, vorticity, shear deformation rate, and normal deformation rate were developed. The results of the two approaches were very similar. The time series for these differential kinematic properties were fairly smooth when the drifters were moving in the Yucatan Current. Otherwise, the time series were ragged with frequent changes in sign. It was speculated that the raggedness is due to small values of the shear rates raggedness is due to small values of the shear rates relative to random observational errors or small-scale turbulent processes. The records of the differential kinematic properties were used to evaluate the stretching and material derivative terms of the vorticity equation. Calculations indicated that potential vorticity is conserved along trajectories in the Yucatan Current. (Sims-ISWS)

HORIZONTAL COHERENCE OF TEMPERA-TURE MICROSTRUCTURE, Bedford Inst. of Oceanography, Dartmouth (Nova

J. A. Elliott, and N. S. Oakey. Journal of Physical Oceanography, Vol 5, No 3, p 506-515, July 1975. 11 fig, 9 ref.

Descriptors: *Oceans, *Temperature, *Thermal properties, *Atlantic Ocean, Internal waves, Sampling, Data processing, Correlation analysis, Oceanography. Identifiers: *Temperature microstructure, *Denmark Strait, Horizontal coherence.

Temperature gradient records from vertical lowering of an array of four thermometers were used to trace microstructure features horizontally over a distance of 46 cm. Identifiable features were found to have a slope and a vertical velocity or curvature with a statistical distribution similar to that exon horizontally-layered microstructure. The horizontal extent of microstructure with a vertical scale greater than 5 cm was at least an order of magnitude greater than its vertical scale. (Simstructure) W76-01259

MEASUREMENTS OF WIND-DRIVEN FLOW PROFILES IN THE TOP MILLIMETER OF

WATER,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and
Meteorological Labs.
For primary bibliographic entry see Field 2H.
W76-01260

ON THE DEPTH OF THE HALOCLINE IN AN

John Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Marine Science.

N. K. Long. Journal of Physical Oceanography, Vol 5, No 3, p 551-554, July 1975. 2 fig, 12 ref. ONR N00014-67-A-0163-0013.

Descriptors: *Estuaries, *Saline water-freshwater interfaces, *Depth, *Model studies, Laboratory tests, Inflow, Mixing, Stratification, Interfaces, Density, Salinity, Flow, Circulation. Identifiers: *Halocline.

The depth of the halocline in an estuary was related to the fresh water influx using simple and general arguments. It was shown that the depth becomes large for both weak and strong influxes. The result was similar to observations in a labora-tory experiment and in the Alberni Inlet. (Sims-ISWS) 76-01270

ALONGSHORE COHERENCE AT LOW FREQUENCIES IN CURRENTS OBSERVED OVER THE CONTINENTAL SHELF OFF OREGON AND WASHINGTON,

Department of the Environment, Ottawa (Ontario). Ocean and Aquatic Affairs.

A. Huyer, B. M. Hickey, J. D. Smith, R. L. Smith, and R. D. Pillsbury.

Journal of Geophysical Research, Vol 80, No 24, p 3495-3505, August 20, 1975. 9 fig, 6 tab, 15 ref. NSF ID071-04211, ERDA AT (45-1)-2225.

Descriptors: *Ocean currents, *Continental shelf, Descriptors: "Ocean currents, "Continental shelf, "Pacific Ocean, "Pacific Northwest U.S., Con-tinental slope, Coasts, Currents(Water), Ocean circulation, Winds, Current meters, Flow mea-surement, On-site investigations, Sea level, Regression analysis, Oceanography. Identifiers: "Current observations, Spectral analy-

sis. Coherence.

Current observations over the continental shelf at Ucations off central Oregon and southern Washington had the period from July 18 to September 18, 1972, in common. Low-frequency fluctuations (less than one cycle per day) in the curtuations rents were compared by means of visual display, linear regression, and spectral analysis. The currents were highly coherent over an alongshore separation of 200 km. Coherent signals occurred at 0.16, 0.3, and 0.44 cpd. The signal at 0.16 cpd occurred with high mutual coherence in wind, cur-rent, and sea level and may be a forced shelf wave driven by the wind. The signal at 0.3 cpd had high coherence between current and sea level and may be a free shelf wave generated by the wind. Cor-relation between observations was higher for separations in the alongshore direction than in the offshore direction in spite of greater separations. (Sims-ISWS) W76-01271

INTERNAL WAVE DISPERSION CALCULATED USING THE THOMSON-HASKELL METHOD,

Lamont-Doherty Geological Dept. of Geology, M. Fliegel, and K. Hunkins.

Journal of Physical Oceanography, Vol 5, No 3, p 541-548, July 1975. 12 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Internal waves, *Dispersion, *Oceans, *Model studies, Computer models, Mathematical models, Density, Arctic Ocean, Atlantic Ocean, Waves(Water), Oceanography. Identifiers: Brunt-Vaisala frequency.

The dispersion and amplitude characteristics of internal wave motion were determined by a matrix method which lends itself readily to computer analysis. A layer density structure may be chosen to fit actual oceanic conditions. The method was shown to have good agreement with a simple analytical solution. Dispersion and amplitude characteristics have been determined for two typical oceanic sites, one in the Arctic Ocean and one in the Atlantic. (Sims-ISWS)

TOWARD NEW MASS AND HEAT BUDGETS FOR THE ARCTIC OCEAN, Washington Univ., Seattle. Dept. of Oceanog-

For primary bibliographic entry see Field 2C. W76-01297

MULTIPLE OFFSHORE BARS AND STANDING

Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

Journal of Geophysical Research, Vol 80, No 27, p 3838-3840, September 20, 1975. 4 fig. 1 tab, 13 ref.

Descriptors: *Coastal *Waves(Water), *Standing waves, Shores, *Sedimentation, *Sand bars, *Alaska, Winds, Onsite investigations, Sediment transport, Currents(Water), Geomorphology.

Identifiers: *Offshore bars, Progressive waves.

Field measurements of multiple offshore bar spacing were compared to theory and wave measure-ments to corroborate the suggestion that bar for-mation an spacing are controlled by standing waves in the infragravity range (0.5-5 min). Theoretical and experimental studies predicted the reflection of progressive waves from a shoreline as standing waves. Associated drift in the bottom boundary layer was expected to produce sediment noundary layer was expected to produce sediment accumulation and bar formation under either the nodal or the antinodal points. Measurements of waves in the infragravity spectrum confirmed the occurrence of such standing waves, and spacing of offshore bars in adjacent areas correlated well with the predicted position of the bars. (Bhowmik-ISWS) W76-01298

SEDIMENTATION OF ORGANIC MATTER IN ST. MARGARET'S BAY, NOVA SCOTIA, Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.

T. J. M. Webster, M. A. Paranjape, and K. H.

Mann.

Journal of the Fisheries Research Board of Canada, Vol 32, No 8, p 1399-1407, August 1975. 5 fig, 2 tab, 25 ref.

Descriptors: *Sediments, *Organic matter, *Inorganic compounds, *Canada, Food chains, Suspended solids, Seashores, Bays, Phytoplankton, Fish eggs, Sedimentation rates, Runoff, Bottom sediments, Detritus, Sampling, Analysis, Car-bon, Kelps, Aquatic plants, Aquatic productivity, Identifiers: "Sediment traps, "St. Margaret's Bay(Canada), "Nova Scotia, Seaweeds,

Sediment traps were placed at two sites in St. Margaret's Bay. At a deep station (70m), traps were placed 5m and 10m above the bottom; at a shallow station (10m), six traps were placed between 45 and 197 cm above the bottom. Total catch averaged 118g carbon per sq m per yr at the deep station and 134g carbon per sq m per yr at the shal-low station. The most probable source of the organic matter was detritus derived from seaweeds and seagrasses, but the most probable source of inorganic material was bottom sediment. It was suggested that the traps were taking bottom sediment resuspended from shallow water, enriched by detritus from seaweeds and seagrasses. (Lee-W76-01311

MISSISSIPPI RIVER MOUTH PROCESSES: EF-FLUENT DYNAMICS AND MORPHOLOGIC DEVELOPMENT, Louisiana State Univ., Baton Rouge. Coastal Stu-

L. D. Wright, and J. M. Coleman.

Available from the National Technical Information Service Springfield, Va 22161 as ADA-005-793, \$4.00 in paper copy, \$2.25 in microfiche. ONR NR-388-002. ONR N00014-69-A-0211-0003. Jour-nal of Geology, Vol 82, p 751-778, 1974. 14 fig, 1 tab. 66 ref.

Descriptors: *Mississippi River, *Geomorphology, *Deltas, Dynamics, Model studies, On-site investigations, Remote sensing, Flow, Sedimentation, Density, Salinity, Sea water, Suspended solids, Land forming, Rivers, River flow, Deposition(Sediments), Estuaries. Identifiers: *River mouth processes, Salt wedge intrusion. River mouths.

Effects of outflow inertia, turbulence, bottom fric-tion, buoyancy, and marine forces to river mouth

Group 2L—Estuaries

outflow dynamics and sediment deposition vary. Effluent behavior varies significantly with river stage and between 4 dynamic regions. During low normal river stages, when a salt wedge in trudes into the distributary channel, Region I, which extends from the mouth to about 4 channel widths seaward, is characterized by buoyancy-dominated lateral effluent expansion, vertical thinning, and vertical saltwater entrainment. In Region II, which is situated over the distributary-mouth bar crest, the density interface approaches closest to the surface, densimetric Froude numbers attain maxima, internal waves break, and intense mixing occurs. Region III, approximately between 6 and 10 channel widths seaward of the mouth, is characterized by an internal hydraulic 'jump' in which densimetric Froude numbers decrease to subcritical values and the depth of the density in-terface increases. In Region IV, extending about 10 channel widths seaward of the mouth to the seaward limits of the effluent, densimetric Froude numbers are subcritical; the surface effluent expands under the influence of buoyancy and is sub-ject to mixing by marine forces. When the river is flooding, the salt wedge is flushed seaward beyond the bar crest; turbulent mixing, strong bottom shear, and seaward bed-load transport prevail throughout Region I. Under these conditions, the effects of buoyancy are weak. Throughout most of the year, the combined effects of effluent buoyancy and saltwater entrainment create lateral convergence of flow near the bottom and beneath the ef-fluent. (Sims-ISWS) W76-01321

MASS MOVEMENT OF MISSISSIPPI RIVER DELTA SEDIMENTS, Louisiana State Univ., Baton Rouge. Coastal Stu-

dies Inst

J. M. Coleman, J. N. Suhavda, T. Whelan, and L.

Available from the National Technical Informa-tion Service, Springfield, Va 22161, as ADA-001-588, \$3.50 in paper copy, \$2.25 in microfiche. Proceedings, Gulf Coast Association of Geological Societies, Lafayette, Louisiana, p 49-68, October 1974. 21 fig. 36 ref. ONR NR-388-002, ONR N00014-69-A-0211-0003.

*Mississippi River, Descriptors: *Sediments, Geology, Geomorphology, Deposition(Sediments), Sediment load, Sedimentology, Faults(Geologic). Fractures(Geologic). Folds(Geologic), Marine geology, Estuaries, Continental shelf.

Identifiers: *River mouths, Depositional patterns, Peripheral slumping, Clay flowage.

River-mouth depositional patterns are modified by sediment deformational processes of a magnitude to endanger bottom-supported structures, includ-ing: (1) peripheral slumping, (2) differential weighting and dispirism, (3) radial tensional fault-ing, (4) mass wasting and flowage induced by wave motion and degassing, and (5) deep-seated clay flowage. High depositional rates occur near the river mouth and decrease seaward, and with time the bar oversteepens; rotational slump planes form peripheral to the bar front, moving sediment into deeper water. Differential loading by denser bar sands overlying low-density dlays results in vertical and seaward flowage of the clays along with seaward bar progradation. Diapiric folds and spines (mudlumps) intrude into delta-front sediments on the seaward side of the deforming load. The seaward extrusion and continued movement of clays arch the overlying delta-front sediments. A stress relieved by small graben faults oriented radial to the deforming load or delta lobe. The finer grained river-mouth sediments contain high percentages of methane and CO2 gases. Passage of hurricane waves produces bottom pressure perturbations, forcing the entrapped gas upward, causing loss of sediment strength and allowing sub-aqueous mass movement to occur. The weight of the modern delta has depressed underlying Pleistocene sands some 120 meters, causing

squeezing and flowage of clavs onto the continental shelf at water depths greater than 150 meters. (Sims-ISWS) W76-01322

COASTAL DYNAMICS ON CEDAR ISLANDS, VIRGINIA.

University of South Florida, Tampa. Dept. of

Geology. R. A. Davis, Jr., and W. T. Fox.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as ADA-001-068, \$4.50 in paper copy, \$2.25 in microfiche. Report USF-11, June 1, 1974. 66 p, 32 fig, 21 ref, 2 append. NR 388-092, ONR N00014-69-C-0151.

Descriptors: *Fourier analysis, *Meteorological data, *Waves(Water), *Currents(Water), *Virginia, Geomorphology, Coasts, Beaches, Winds, Tides, Groundwater, Breakwaters, En-vironmental effects, Model studies, Computer modesl, Atmospheric pressure, Time series analy-

Identifiers: *Swell waves, Morphologic variables, Coastal processes, Cedar Islands(Va), Wave ener-

A time studies of coastal processes and morphologic responses was conducted during July 1973 on Cedar Island, Virginia. Patterns exhibited by variations in monitored environmental variables showed interrelationships that are quite comparable to those observed in previous similar stu-dies on Lake Michigan and the central Texas coast. As in previous studies, barometric pressure fluctuations appeared to be the key to controlling other processes. Long period swell waves provided the controlling mechanism when they were present in that they caused total wave refraction and no significant longshore currents were present. The combination of a moderate tidal range (6 feet) and longshore bars caused marked effects on coastal processes such as breaker height and longshore currents. Where longshore bars were absent there was no apparent effect of tidal stage on other coastal processes operating on the beach and in the surf zone. (Lee-ISWS) W76-01325

THE INTERACTION OF FLUID AND SEDI-MENT ON THE FORESHORE,

Chicago Univ., Ill. Dept. of Geophysical Sciences; and Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.

C. L. Nelson, and R. L. Miller.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as ADA- 002-452, \$7.50 in paper copy, \$2.25 in microfiche. Technical Report No 15, September 1974, 176 p, 59 fig. 2 tab. 81 ref.

Descriptors: *Sediment transport, *Suspended solids, *Surges, Bores, Flumes, Equipment, Laboratory equipment, Laboratory tests, Beaches, Coasts, Shores, Seashores, Erosion, Beach erosion, Surf, Flow, Froude number, Hydraulic jump, Intertidal areas, Waves(Water). Identifiers: Backwash, Uprush, Swash marks, Unidirectional flow.

Investigation of the sediment transport of uprush and backwash of a single surge cycle was made. Direct observation indicated that for the main body of the fluid, accelerating or decelerating unidirectional flow is a reasonable characterization. The uprush, initially a bore, then a surge over a 'dry bed', has traditionally been considered to be so complicated as to defy characterization of the internal flow. However, it was shown that the uprush may be divided into two distinct portions, the leading portion (the tongue) characterized by extreme turbulence and with a high proportion of sediment in suspension and in traction. The remainder of the uprush and the whole of the backwash may be regarded as decelerating or ac-celerating unidirectional flow, exhibiting the expected but transient sequential bedform features. It appears that analysis of the bedform mechanics is feasible using unidirectional flow methods. (Sims-ISWS) W76-01326

SURVEY FOR THE USE OF REMOTE SENSING IN THE CHEMICAL BAY REGION, Maryland Univ., Solomons. Chesapeak Biological Lah

For primary bibliographic entry see Field 5B. W76-01327

STOCHASTIC ANALYSIS AND CONTROL OF URBAN ESTUARINE WATER-QUALITY SYSTEMS: VOL I--ESTIMATION AND PREDIC-

TION, New York City, Rand Inst. N.Y. For primary bibliographic entry see Field 5G. W76-01340

FLOOD WATER ANALYSIS IN THE AREA OF THE TIDAL RIVER EIDER (HOCHWASSERANALYSE IM RAUM DER BIN-NENEIDER).

For primary bibliographic entry see Field 2E. W76-01428

CLASSIFICATION OF MODELS OF TIDAL WATERS.

Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
J. B. Hinwood, and I. G. Wallis.

Journal of the Hydraulics Division, American Society of Civil Engineering, Vol 101, No HY10, Proceedings Paper 11643, p 1315-1331, October 1975. 1 tab, 141 ref, 1 append.

Descriptors: *Mathematical models, waters, *Tidal effects, *Estuaries, *Hydraulics, *Waste disposal, Dispersion, Model studies, Simulation analysis, Water quality, Path of pollutants, Mixing, Waste water disposal, Water pollu-

Identifiers: *Temporal averaging.

A classification scheme was presented for numerical models of water and waste movement in tidal bays and estuaries. The classification was based on the number of spatial dimensions, the reference frame used, temporal resolution obtainable, and the degree to which hydrodynamic processes are included. Newly developed models can easily be fitted into the scheme. With this classification scheme, different models may be assessed and compared on the basis of their theoretical assumptions. To select a model for a particular task, a sequence of questions may be answered and from the answers the appropriate type of model may be selected. The classification table then indicates the particular physical situation. (Lardner-ISWS) W76-01481 models available to meet the requirements of the

REGIME EQUATIONS AND TIDAL INLETS, Coastal Engineering Research Center, Fort Belvoir, Va.

Available from the National Technical Information Service, Springfield, Va 22161 as AD-A003 778, \$3.50 in paper copy, \$2.25 in microfiche. Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 99, No WW3, Proceedings Paper 9952, p 393-397, August 1973. 1 tab, 8 ref, 2 append.

*Channels, *Tidal *Inlets(Waterways), Hydraulics, Harbors, Flow, Flow characteristics, Regime, Tides, Tidal effects, Equations, Shores, Estuaries. Identifiers: *Regime theory.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3 Water Yield Improvement—Group 3B

Selected regime equations for stable channel cross-sectional areas were compared to an empirical relationship for stable tidal inlet areas. Using an equivalent steady discharge to represent the tidal flow, good agreement was exhibited between the most generalized regime and a tidal prism versus area formula. Although the controlling hydraulic conditions in each case are distinctly unique. the agreement appeared to be more than for-tuitous. (Sims-ISWS) W76-01484

UNIVERSITY OF WASHINGTON WATER STRESS STUDIES, Washington Univ., Seattle. Dept. of Oceanog-

raphy.
For primary bibliographic entry see Field 2C. W76-01485

CURRENT RELATED TO SEDIMENT TRANSPORT AT THE IBERO-MOROCCAN CONTINENTAL SHELF,

Woods Hole Oceanographic Institution, Mass. G. Siedler, and E. Seibold.

Available from the National Technical Informa tion Service, Springfield, Va 22161 as AD-A002 400, \$3.50 in paper copy, \$2.25 in microfiche. Report WHOI-74-86, November 1974. 12 p, 9 fig, 4 tab. 26 ref. ONR N00014-66-C0241

Descriptors: *Sediment transport, *Continental shelf, *Occan currents, Currents(Water), Measurement, On-site investigations, Geology, Marine geology, Sedimentology, Continental slope, Oceans, Atlantic Ocean, Oceanography. Identifiers: *Ibero-Moroccan shelf.

For a study of water motions related to sediment transport, current data and bottom samples were taken in two areas on the Portuguese and Moroccan shelf near the shelf-break and were supplemented by underwater television observations. Some statistical properties of the observed currents were presented, and their representativeness for the water movement very close to the bottom was discussed. It appeared that the slowly varying currents observed were too weak to start sediment transport. To check whether rapidly changing currents would be strong enough, the probability of occurrence of large surface-wave induced components of bottom currents in this area was estimated from wave statistics. It turn out that such oscillatory currents, especially from swell, would be able to set up sediment motion during certain periods. The net transport was caused by slowly varying currents whose average and maximum magnitudes and directions could be obtained from the short time series of the experiment. The geological data, however, supplied some information about the average directions. A sediment transport towards the upper slope was indicated by the regional grain size distribution at the Portuguese shelf. On the average of bottom currents preferred direction of the mean velocity when the sum of surface-wave-induced currents and slowly varying currents was sufficiently large to set up sediment motion. (Sims-ISWS) W76-01491

THE LIFE CYCLE OF CALIFORNIA COASTAL FOG ONSHORE, Calspan Corp., Buffalo, N.Y. For primary bibliographic entry see Field 2B. W76-01493

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COASTAL UPWELLING EXPERIMENT - I AND II, SURFACE HYDROGRAPHIC FIELDS DATA REPORT

Ronsenstiel School of Marine and Atmospheric

Sciences, Miami, Fla.
T. B. Curtin, and C. N. K. Mooers.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 460, \$5.00 in paper copy, \$2.25 in microfiche. Scientific Report, July 1974. 94 p, 29 fig, 3 tab, 2 ref. NSF GX-31264.

Descriptors: *Upwelling, *Coasts, *Oregon, *Salinity, *Temperture, Continental shelf, Surveys, Ships, Pacific Ocean, On-site investigations, Instrumentation, *Data collections, Data Instrumentation, *Data processing, Oceanography.

*Temperature-salinity functions, Fronts(Oceanic).

The report presents all the continuous surface temperature-salinity data recorded aboard Oregon State University vessels during the summers of 1972 and 1973. Most of these cruises constituted part of the Coastal Upwelling Experiments (CUE-1 and CUE-II), a multi-institutional program to study upwelling off the Oregon Coast. The specific objectives of the individual cruises during CUE-I and CUE-II were quite varied; however, the primary focus being the synoptic study of coastal up-welling off Oregon, cruise tracklines were mainly concentrated over the continental shelf region. Surface maps of the temperature, salinity, and density fields at various times during the summers of 1972 and 1973 and of various extents off the Oregon coast were included in the report. In addition, the transshelf variations of these parameters in the surface along two selected lines, the signatures of surface frontal traverses, and the surface temperature-salinity characteristics presented. (Sims-ISWS) W76-01496

MATHEMATICAL MODEL STUDIES OF WATER QUALITY IN THE POTOMAC ESTUA-

Environmental Protection Agency, Annapolis, Md. Annapolis Field Office. For primary bibliographic entry see Field 5B. W76-01497

COASTAL PROCESSES AND SEDIMENTATION ON THE NEW ENGLAND COAST, Massachusetts Univ., Amherst.

M. O. Hayes.

Available from the National Technical Informa Standard Holman (1997) the National Technical Information Service, Springfield, Va 22161 as AD-775 851, \$6.00 in paper copy, \$2.25 in microfiche. Final Report, July 1972. 142 p. 31 fig. 2 tab, 7 ref, 2 append. U.S. Army DACW-72-67-C-0004.

Descriptors: *Coasts, *Sedimentation, *Beaches, "New England, Projects, Waves(Water), Ocean waves, Atlantic Ocean, Seashores, Bays, Geomorphology, Sediments, Estuaries, Tidal waters, On-site investigations.

Identifiers: "Cape Cod(Mass).

The report presented an abstracted account of work completed on data collected on the New England coast from central Maine to southern Cape Cod and partially summarized six years of field observations conducted throughout all seasons of the year. It included beach profiles measured at 13 localities, sedimentation studies at five tidal inlets. studies of sediment dispersal patterns, waverefraction studies, and other studies of coastal morphology and sedimentation. Thirty-five abstracts of completed projects were included in an appendix. (Sims-ISWS) W76-01498

THE EFFECT OF BREAKER SHAPE ON IM-PACT PRESSURES IN SURF, Chicago Univ., Ill. Dept. of the Geophysical

R. L. Miller, S. Leverette, J. O'Sullivan, J.

Tochko, and K. Theriault.

Available from the National Technical Information Service, Springfield, Va 22161 as AD-A002 451, \$4.50 in paper copy, \$2.25 in microfiche. Technical Report No 14, September 1974. 51 p. 11 fig. 1 tab, 17 ref, 1 append. ONR N00014-67-A-0285-0018. Descriptors: *Surf. *Waves(Water). *Beaches. Breakwaters, Bores, Pressure, Ocean waves, On-site investigations, Fluid mechanics, Seashores,

Identifiers: *Cape Cod(Mass), Impact pressures, Breaking waves, Breaker mechanics

Field measurements were made of the vertical distribution of impact pressures exerted by breaking waves, Four distinct types were recognized and compared. These were near-breaking wave, plunging breaker, spilling breaker and post-breaking bore. The measurements were obtained by placing a 6-foot aluminum flat plate, backed by a cylinder in the surf zone, so that the flat faced the approaching breakers. Five sensors were placed at one foot intervals in the flat. The sensors consisted of strain gage mounted aluminum disphragms. Results indicated the impact pressure is significantly influenced by breaker type. The bore generated the largest impact pressures, followed in decreasing order by plunging breaker, spilling breaker and near-breaking wave. In the vertical array, the largest impact pressures were recorded at or near the top, except for the bore where the reverse occurred. A qualitative explanation was given of various phenomena associated with impact pressures, by considering breaker mechanics. W76-01499

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS PROCESS USING CROSS-LINKED AROMATIC POLYAMIDE MEM-BRANES. Department of the Interior, Washington, D.C. Of-

Fice of the Secretary.

R. McKinney, Jr., and W. L. Hofferbert.

U.S. Patent No 3,904,519, 6 p, 7 ref; Official
Gazette of the United States Patent Office, Vol 938, No 2, p 766, September 9, 1975.

Descriptors: *Patents, *Water purification, *Desalination, *Reverse osmosis, *Separation techniques, *Water quality control, *Membrane processes, *Water pollution control, Saline water, Membranes, Chemical reactions. Identifiers: Aromatic polyamide membranes.

A reverse osmosis process is used for the purification of saline water. A pressure in excess of the osmotic pressure of the saline water feed solution is applied to the solution separated from purified water by a semipermeable membrane. Pure water is thereby caused to diffuse through the membrane while the salt molecules or other impurities are retained by the membrane. Reverse osmosis membranes of improved flux or flux stability are prepared by crosslinking aromatic polyamide membranes. Crosslinking may be achieved by reaction with crosslinking reagents such as al-dehydes, polyamines, polycarboxylic acids, polyisocyanates, oxidizing agents, peroxides, etc. It may also be accomplished by means of irradiation, e.g., with gama radiation. (Sinha-OEIS) W76-01134

3B. Water Yield Improvement

SNOWPACK DYNAMICS IN RELATION TO IN-VENTORY-PREDICTION VARIABLES
ARIZONA MIXED-CONIFER,

Arizona Univ., Tucson. Dept. of Watershed Management. For primary bibliographic entry see Field 2A. W76-01123

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3B-Water Yield Improvement

EFFECT OF SULFURIC ACID ON WATER MOVEMENT IN CALCAREOUS SOILS, Arizona Univ., Tucson. Dept. of Soils, Water and

Engineering. T. A. Yahia.

Master of Science Thesis, 1974. 50 p, 4 fig, 9 tab, 4 append, 42 ref.

Descriptors: *Water utilization, *Calcareous soils, *Penetration, *Soil water movement, *Soil treatment, Water, Water management, Irrigation, Range lands, Irrigated lands, Flow, Movement, Permeability, Leaching, Salts, Chemicals, Sodi-

Sulfuric acid, which may become abundant through industrial by-product recovery, can be used as an aid to increase water penetration of sodium-affected calcareous range land and irrigated soils. Water penetration into calcareous soils was measured in soil columns after sulfuric acid was applied to the soil surfaces. Water penetration reached a maximum with increasing rates of acid application before decreasing at the highest rates. Surface-applied sulfuric acid was more effective than equivalent amounts of applied gypsum. (McLachlan-Arizona) W76-01124

SOIL WATER DEPLETION BY LODGEPOLE PINE ON GLACIAL TILL

Intermountain Forest and Range Experiment Station, Ogden, Utah.

For primary bibliographic entry see Field 2G.

W76-01221

W76-01323

ACCUMULATING SNOW TO AUGMENT THE FRESH WATER SUPPLY AT BARROW, ALASKA.

Cold Regions Research and Engineering Lab., Hanover, N. H. For primary bibliographic entry see Field 2C.

FREEZING NUCLEATION IN AQUEOUS ELEC-

Wyoming Univ., Laramie. Dept. of Atmospheric Sciences.

For primary bibliographic entry see Field 2B. W76-01479

3C. Use Of Water Of Impaired Quality

AVERT RUNOFF POLLUTION,

For primary bibliographic entry see Field 5D. W76-01025

RUNOFF CONTROL SYSTEMS FOR CONCRETE DAIRY CATTLE YARDS Wisconsin Univ., Madison. Coll. of Agricultural

and Life Sciences. For primary bibliographic entry see Field 5B. W76-01039

REUSE OF EFFLUENT FOR AGRICULTURAL PURPOSES.

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research For primary bibliographic entry see Field 5D. W76-01416

3D. Conservation In Domestic and Municipal Use

WATER REUSE: A FLEXIBLE AND EFFICIENT MANAGEMENT ALTERNATIVE FOR MU-NICIPAL WATER SUPPLY,

Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 5D. W76-01330

DETERMINATION OF URBAN WATERSHED

RESPONSE TIME, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 4D. W76-01339

PRIVATELY-OWNED SUPPLY WATER

Lehigh-Northampton Counties J Commission, Lehigh Valley, Pa. A. R. O'Dell, and A. B. McCracken. Counties Joint Planning Final report, September, 1974. 45 p, 3 fig, 1 tab, 2 append, PA-03-26-1030-01.

Descriptors: Water supply, *Dependable supply, Hydrology, *Storage requirements, *Water distribution(Applied), *Water conveyance, Water policy, Water comply development, Water allocation(Policy), Planning, Legislation, *Pennsylvania. Identifiers: Lehigh County(Pa), Northampton County(Pa).

An inventory of almost 50 privately owned water supply systems (PWS) in Lehigh and Northampton Counties was undertaken to assess the current situation and present recommendations and policies to resolve the potential problems which result from proliferation of PWS. Using data obtained from Pa. Department of Environmental Resources (DER) and Public Utilities Commission (PUC), the following information was recorded: name of supplier; PUC regulation; number of customers; percent of total water use by type of customer; average water use per dwelling unit; projected number of fire hydrants; treated water storage tanks; and water supply sources. Potential problems, including conflicts with regional water supply plan, level of service and inadequacy of existing regulations and enforcement emphasize the need to develop water supply guidelines. Conclusions are that (1) private water systems should be identified and regulated during the subdivision review process, and then required to connect with the public water supply system when a feasible extension and adequate supply is available; (2) standards and regulations specifying water supply quantity and facilities for a PWS should be established by DER and PUC; (3) PWS should be allowed in areas where regional water system is not foreseen as they may provide reliable service at lower costs than individual water systems. Appendices include a compilation of applicable regu-lations and guidelines for water supply systems as well as an environmental assessment of the proposed recommendations. (Salzman-North Carolina) W76-01366

PRICE-INVESTMENT POLICIES OF URBAN WATER AUTHORITIES, New South Wales Univ., Kensington (Australia).

For primary bibliographic entry see Field 6C. W76-01422 School of Economics.

URBAN WATER DEMAND: AN ECONOMIC

EVALUATION, Sydney Univ., (Australia). School of Economics. For primary bibliographic entry see Field 6D. W76-01423

3F. Conservation In Agriculture

ELONGATION CHARACTERISTICS OF COR-RUGATED PLASTIC TUBING.

Ohio State Univ., Columbus G. O. Schwab, and R. D. Brehm.

Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. Paper No 74-2544 American Society of Agricultural Engineers, St. Joseph, Michigan. 5 fig, 6 ref.

Descriptors: *Plastic pipes, Plastic deformation, Temperature, Pipelines, Construction, Tubes. Identifiers: Corrugated tubing, Elongation, Stretching.

Elongation (stretch) of circular corrugated plastic tubing decreased parallel plate stiffness at 5% deflection about 1.6%, 2.3%, and 0.4% for each one percent elongation of 76 mm (3-in, 102 mm (4and 152 mm (6-in) diameter tubing, respectively. Four brands of tubing were included in the tests. Stiffness of 203 mm (8-in) diameter tubing consistently (4 brands) increased up to 5% elongation with only a small decrease at 10%. In other tests the elongation of three brands of 102 mm tubing varied from about 2 to 6% at 23 C (standard test temperature) and from 9 to 18% at 70 C. For all three brands tested, elongation varied linearly with temperature. Spiral corrugations showed less elongation than circular corrugated tubing. Elongation of corrugated tubing in the field as installed with several trenching machines varied from zero to 4.5% with an average of 2.1%. Although tubing temperature was high (35 to 52 C), temperature did not appear to be a major cause of stretching. Frictional drag and other effects as the tubing passed through the machine caused most of the stretching. The study showed that elongation is not a serious (up to 5%) problem unless the contractor is careless or intentionally stretches the tubing. (Skogerboe-Colorado State) W76-01064

STEADY INFILTRATION FROM LINE SOURCES BURIED IN SOIL, Department of Agriculture, Watkinsville A. W. Thomas, E. G. Kruse, and H. R. Duke.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 1, p 125-128, 133, January-February 1974. 7 fig, 6 ref.

Descriptors: *Soil water movement, *Subsurface irrigation, *Infiltration, *Mathematical studies, Mathematical modeling, Irrigation systems, Irrigation, Agriculture, Model studies, Capillary con-Identifiers: *Trickle irrigation, *Drip irrigation.

Results are presented of a study of steady infiltration from a distribution of buried line sources which lie in a horizontal plane and are parallel and equally spaced. The sources simulate subsurface irrigation laterals. An analytical solution is made possible by the use of a quasilinear form of the dif-ferential flux equation and an exponential relationship between hydraulic conductivity and capillary potential of the soil modeled. The objective of the paper is to develop the analytical solution and compare the computed distributions of capillary potential for normal field lateral spacings and depths with those computed by more complex methods. (Skogerboe-Colorado State) W76-01065

WATERHAMMER CONSIDERATIONS FOR PVC PIPELINE IN IRRIGATION SYSTEMS,

Certain-Teed-Products Corp., Valley Forge, Pa. W. R. Seipt.

Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 3, p 417-423, May-June 1974. 6 fig, 5 tab, 26 ref.

Descriptors: *Water hammer, Hydraulic conduits, Hydraulic design, Hydraulic equipment, Hydrau-lic structures, Irrigation design, Flow charac-teristics, Agriculture, Irrigation, *Irrigation systems.
Identifiers: *Polyvinyl chloride pipe.

Waterhammer pressure develops whenever flow is changed. Flow changes occur by operating valves, by starting or stopping pumps, or by sudden release of entrapped air. Its intensity depends upon the rate of change. On occasion, it damages piping. Waterhammer can be contained by: adequate design; proper installation and responsi-ble use. (Skogerboe-Colorado State)

UPWARD WATER MOVEMENT IN FIELD

Kentucky Univ., Lexington. Dept. of Agricultural Engineering. L. G. Wells, and R. W. Skaggs.

Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois, American Society of Agricultural Engineers. St. Jospeh, Michigan. 15 fig, 2 tab, 25 ref, Paper No 74-2572.

Descriptors: *Subsurface irrigation, *Soil water movement, Irrigation, Irrigation design, Irrigation systems, Hydraulic conductivity, Model studies, Soil properties.

Identifiers: Subirrigation, Richards equation, Pressure potential.

Subirrigation experiments were conducted under various initial and boundary conditions using large, undisturbed soil cores representing two field soils. Water flow volumes and pressure potential distributions were monitored continuously during each test. The desorption soil water characteristic was determined for both soils using pressure plates. The effective saturated hydraulic conduc-tivity was determined for each core used in the exnents. The relationships between hydraulic conductivity and pressure potential, K(k), were determined for each soil type transient pressure potential measurements during a drainage event. An approximate model was developed to describe vertical water movement during subirrigation. The model assumed that the water rises uniformly in the profile, making no provision for water move-ment in advance of the water table. The model is capable of considering profile stratification. Also the one dimensional h-based form of the Richards equation was solved numerically for conditions corresponding to those imposed during the experiments. (Skogerboe-Colorado State) W76-01068

HIGH RATE SPRINKLING OF A LOW INTAKE

SOIL, Agricultural Research Service, Brawley, Calif. L. S. Willardson, B. L. Ertsgaard, C. F. Ehlig, and A. J. MacKenzie.

Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 2, p 280-281, March-April 1974. 2 fig, 1 tab.

Descriptors: *Sprinkler irrigation, Irrigation practices, Irrigation operation and management, Irrigation effects, Frequency, Puddling, Soil manage-ment, Soil properties, Irrigation, Agriculture. Identifiers: Soil crusting.

Water can be applied to low intake rate soils by sprinklin at high average application rates if water is applied intermittently and the average applica-tion rate does not exceed the average instantaneous intake rate during the interval of operation. Soil crusts formed on the soil surface when the soil dried, but these crusts did not interfere with plant growth. Greater total amounts of water can b plied without causing ponding and loss of soil sur-face structure by the use of short sprinkling inter-vals and by applying smaller amounts of water per day. For equal amounts of applied water, short duration--high frequency applications caused less loss of soil surface structure than long duration-low frequency applications. (Skogerboe-Colorado W76-01069

DRIP IRRIGATION DESIGN BASED ON UNIFORMITY

Hawaii Univ., Honolulu. Dept. of Agricultural En-

gineering. I. Wu, and H. M. Gitlin.

Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 3, p 429-432, May-June 1974. 4 fig, 5 ref.

Descriptors: *Uniformity coefficient, *Irrigation design, Irrigation systems, Irrigation, Agriculture. Identifiers: *Trickle irrigation. *Drip irrigation.

Presented is a general shape of energy gradient line which can be applied to distribution and variation of emitter discharge along the lateral. A design chart is presented for determining an acceptable combination of lateral lengths and inlet pressure of a drip irrigation system. The chart helps in selecting a drip irrigation line based on a desirable or acceptable uniformity coefficient. The designer can try different combinations of pressure and length order to obtain a design which is acceptable. (Skogerboe-Colorado State)

INSTALLATION CHECKS ON 4-INCH (102 MM) CORRUGATED POLYETHYLENE DRAIN TUB

ING, Soil Conservation Service, Upper Darby, Pa. D. E. McCandless, Jr.

Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois, Paper No 74-2543, American Society of Agricultural Engineers. St. Joseph, Michigan. 8 tab, 3 ref.

Descriptors: *Plastic pipes, Pipelines, Construction, Drainage, Drainage engineering, Drainage practices, Tubes, Sands, Clays, Gravels. Identifiers: Corrugated tubing, Polyethylene.

Results of 54 installation checks on a 4-inch (102 mm) corrugated polyethylene drain tubing in 4 Northeastern states are reported. Checks were made by Soil Conservation Service personnel with the assistance of farmers, contractors, and manufacturers' representatives. Tubing installed in gravelsoil sites generally had deflections 2 to 5 percent higher than those in clay or sandy soils. Tubing installed in sandy soils had the least deflection and commonly ranged from 13 to 20 percent. Tubing installed in trenches 4 to 5 feet (1.2 to 5 m) deep in sandy soils was doing as well or better than tubing installed at lesser depths. Subsurface drains in the Northeast are commonly installed in trenches 1-1/2 to 4 feet (0.8 to 1.2 m) deep. With 14 percent of the sites being classified as unsatisfactory, it is obvious that in many areas of the Northeast there is a need for a training and installation program on good installation procedures for SCS personnel, contractors, and farmers. (Skogerboe-Colorado State) W76-01071

ANHYDROUS AMMONIA APPLICATION IN IRRIGATION WATER VS. MECHANICAL AND ITS EFFECT ON CORN YIELDS,

Nebraska Univ., Dept. of Agricultural Engineer-

H. R. Mulliner, and K. D. Frank.

Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. Paper No 74-2567, American Society of Agricultural Engineers. St. Joseph, Michigan. 4 tab. Descriptors: *Nitrogen, *Nitrogen compounds, *Corn, Fertilization, Fertilizers, Irrigation practices, Irrigation water, Irrigation, Irrigation effects, Plant growth, Ammonia.
Identifiers: *Anhydrous ammonia

Application of anhydrous ammonia in surface irrigation distribution systems requires top level management. From an energy standpoint, it is more effective because optimum yields can usually be obtained with less nitrogen, and the energy for mechanical application is saved. In the manufacturing process, energy is required to convert anhydrous ammonia to ammonium nitrate and urea; thus, the ability to utilize anhydrous amurea; thus, the ability that a directly in surface irrigation systems is an additional savings of energy. Salts in the irrigation water presented no problem of enerusting inside the distribution system (aluminum gated pipe) when the inhibitor sodium polyphosphate was used. Irrigation water will carry from 50 to 110 ppm anhydrous ammonia before it is lost into the atmosphere. Keeping within these limitations is necessary for efficient application. Optimum grain yields were obtained with the application of 120 pounds of nitrogen. In 1972, grain yields were es-sentially the same whether anhydrous ammonia was applied in the irrigation water or applied mechanically. In 1973, water applied anhydrous ammonia gave significantly better yields than mechanically applied ammonia. (Skogerboe-Colorado State) W76-01072

ALTERNATE-FURROW IRRIGATION OF FINE TEXTURED SOILS.

Southwestern Great Plains Research Center, Bushland, Tex.

J. T. Musick, and D. A. Dusek

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 2, p 289-294, March-April 1974. 10 fig, 1 tab, 8 ref.

Descriptors: *Furrow irrigation, *Furrow systems, Irrigation effects, Irrigation efficiency, Irrigation practices, Furrows, Crop response, Sugarbeets, Grain sorghum, Potatoes, Soil salinity, Infiltration rates, Irrigation, Agriculture, Silts, Clays, Loam. Identifiers: Alternate furrow irrigation, Pullman

Alternate-furrow irrigation of bed-furrow spacings ranging from 30 to 40 inches were evaluated for i rigating slowly permeable Pullman soils. Al-ternate-furrow irrigation had little effect on water intake and yields on Pullman silty clay loam but significantly reduced both intake and yields of su-garbeets and grain sorghum on Pullman clay loam. The reduction in water intake and yields was concentrated on the lower one-fourth to one-half of the field plots depending primarily on the irrigated furrow spacing and length of run. Lateral wetting extended from the irrigated furrow into the adjacent nonirrigated furrow past midfield under all conditions evaluated. Alternate-furrow irrigation of bed-furrow spacings exceeding 30 inches is not recommended on slowly permeable clay loam soils. Although alternate furrow irrigation significantly reduced size of irrigation, the concentration of this effect on the lower part of a field and associated yield reductions limits the usefulness of the practice for more efficient management and use of water. (Skogerboe-Colorado State)

THE EFFECT OF SOIL WATER SUPPLY ON CORN FERTILIZER RESPONSE.

W76-01073

Agricultural Research Service, Morris, Minnesota. T. C. Olson, and C. A. Onstad.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 5, p 914-916, September-October 1974. 5 tab, 10 ref.

Descriptors: *Crop response, *Corn, *Soil water, *Fertilization, Rainfall, Crop production,

Field 3-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

Agriculture, Agronomic Statistics. Moisture stress, Moisture availability, Moisture content. *Soil-water-plant relationships.

The study reported was designed to determine the possibility of estimating the optimum amount of fertilizer needed for greatest efficiency when the amount of water stored in the soil profile at plantamount of water stored in the soft priorite at planting time is known. Conversely, would increasing stored water increase the efficiency of fertilizer. Response to applied fertilizer under different levels of stored water at planting and different patterns of rainfall were studied to identify the types of interactions between water stress and fertility response by corn. Corn grain yields for six treatresponse by corn. Corn grain yieus to six treatments are reported for each year. Significant differences as indicated by LSD are shown on an individual year basis. Annual average yields of main treatments illustrate the influence of stored water. The combined analysis of varience indicated highly significant differences in yield among years but no significant difference in overall average yields among main treatments or between fertility levels. The year x main treatment, and the year x fertility-level interactions were both highly significant (p= 0.01) and the main-treatment x fertility level x year interaction was significant at the 0.05 level. (Skogerboe-Colorado State) W76-01075

CHAMBER METHOD OF SUBSURFACE AND DRIP IRRIGATION.

Massachusetts Univ., Amherst. Dept. of Food and

Agricultural Engineering. E. S. Pira, and K. S. Purohit.

Transactions of the (ASAE) American Society of Agricultural Engineers, Vol 17, No 2, p 282-285, March-April 1974. 6 fig, 18 ref.

Descriptors: *Design criteria, *Irrigation design, Descriptors: "Design criteria, "Irrigation design, *Subsurface irrigation, "Head loss, Irrigation methods, Flow rates, Irrigation, Agriculture, Orchards, Discharge frequency. Identifiers: "Trickle irrigation, "Furrow irrigation, *Uniformity, Drip irrigation, Chamber method.

By varying cross sectional area and length of the low pressure distribution line (chamber), uniform low pressure distribution line (chamber), uniform discharge rates can be produced through emitters. Discharge rates can be changed by adjusting chamber pressure. 'Quick-fill' is necessary to make the system practical. In other words, the chamber must be charged with water before good operation begins. Field installation in an apple orchard is discussed. (Skogerboe-Colorado State) W75-0.1076. W76-01076

CONTROLLING CENTER PIVOT SPRINKLERS FOR EXPERIMENTAL WATER APPLICATION, Agricultural Research Service, Fort Collins, Colo. For primary bibliographic entry see Field 7B. W76-01080

FIELD LEACHING BY SPRINKLER AND SURFACE IRRIGATION DURING A CROP SEASON,

Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center. For primary bibliographic entry see Field 4B. W76-01081

IRRIGATION TIMING BY THE STRESS DAY

INDEX METHOD,
Texas A and M Univ., College Station. Dept. of
Agricultural Engineering.
E. A. Hiler, T. A. Howell, R. B. Lewis, and R. P.

Boos.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 3, p 393-398, May-June 1974. 2 fig. 8 tab. 28 ref.

Descriptors: *Stress, *Stress analysis, Irrigation practices, Crop production, Optimization, Water conservation, Water requirements, Irrigation, Agriculture, Plant growth.

Identifiers: *Stress day index, *Irrigation scheduling, SDI.

A potentially useful concept for optimizing irriga-tion timing is the stress day index (SDI). The SDI and its components are defined and examples are used to show how this approach can be utilized for timing irrigations. Experimental findings related to use of SDI are presented. The SDI concept is foruse of SDI are presented. The SDI concept is for-mulated as the product of a crop susceptibility fac-tor (CS) and a stress day factor (SD). Values of CS depend on species and stage of development and indicate the plant's susceptibility to a given water deficit at different growth stages. A method for determining CS is given along with quantitative values for various irrigated crops. Irrigation timing is accomplished with the SDI approach when the daily SDI (daily SD x CS for the appropriate growth stage) reaches some predetermined critical value. Basically, the water deficit indicator (SD) is weighted according to crop sensitivities at dif-ferent growth stages so that reduced water deficit occurs during critical periods. (Skogerboe-Colorado State) W76-01082

OPTIMIZATION OF WATER USE EFFICIENCY UNDER HIGH FREQUENCY IRRIGATION: II SYSTEM SIMULATION AND DYNAMIC PRO-

SYSTEM SIMULATION AND BYMAN OF THE STANDARD OF resented at 1974 winter meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. Paper No 74-2565, American Society of Agricultural Engineers, St. Joseph, Michigan, 28 p, 3 fig, 5 tab, 17 ref.

Descriptors: *Optimization, Dynamic programming, Simulated rainfall, Simulation analysis, Monte Carlo method, *Water utilization, Irrigation practices.

Identifiers: *High frequency irrigation, System simulation.

An environmental simulation model (temperature rainfall, and potential evaporation) was developed for Temple, Texas. Using Monte Carlo techniques, daily environmental data could be simulated for input to the soil water balance model. The simulation results adequately represented the stochastic serial-correlation of represented the stochastic serial-correlation of these variables. Stochastic dynamic programming was used to maximize yield, subject to water availability constraints. These results showed the proper irrigation decision for each period of the soil water content and amount of irrigation water at the start of the period were known. Finally, these results demonstrated that the irrigation amount could be substantially reduced without a large decrease in expected yield if the irrigation water was distributed optimally over the season. This study demonstrated the tremendous possibilities of applying the techniques of system simulation, dynamic programming and decision analysis to the irrigation problem. (Skogerboe-Colorado State) W76-01083

MODELING INFILTRATION AND REDISTRIBUTION OF SOIL WATER DURING INTERMITTENT APPLICATIONS,
Minnesota Univ., St. Paul. Dept. of Agricultural

Engineering. For primary bibliographic entry see Field 2G. W76-01085

TRICKLE IRRIGATION DESIGN PARAME-TERS, Utah State Univ., Logan. Agricultural and Irriga-

tion Engineering.
J. Keller, and D. Karmeli

Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 4, p 678-684, July-August 1974, 4 fig, 1 tab, 12 ref. Descriptors: *Design criteria, *Irrigation design, Design flow, Flow characteristics, Irrigation, Agriculture, Irrigation efficiency.

Identifiers: *Trickle irrigation, *Drip irrigation, Emission uniformity, Trickle irrigation emitters.

Basic definitions, objectives of trickle irrigation and advantages and disadvantages are described. Formulas for computation of irrigation depth and interval, flow rates through emitters, system capacity, flow characteristics of various emitters, and emission uniformity (EU) are all presented. Lateral and manifold design are presented along with an example of system layout with complete design figures. (Skogerboe-Colorado State)

INVESTIGATIONS OF THE APAC WATER SEEPAGE BARRIER,

Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics. For primary bibliographic entry see Field 8G. W76-01115

AUTOMATED VALVES FOR SURFACE IR-RIGATION PIPELINES,

Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center. For primary bibliographic entry see Field 4A. W76-01120

EFFECTS OF AGRICULTURE ON EROSION AND SEDIMENTATION IN THE PIEDMONT ROVINCE, MARYLAND, Denver Univ., Colo. Dept. of Geography. For primary bibliographic entry see Field 2J.

THE ECONOMIC EFFICIENCY OF INTER-BASIN AGRICULTURAL WATER TRANSFER HTAH: IN UTAH: A MATH GRAMMING APPROACH, MATHEMATICAL PRO-

W76-01266

Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan. For primary bibliographic entry see Field 4A. W76-01341

TRADEOFFS RETWEEN IRRIGATION SYSTEMS WITH DIFFERENT RELIABILITIES OF SUPPLY

New South Wales Univ., Kensington (Australia). School of Economics. N. Dudley

In: Hydrology Symposium, Armidale Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 144-147, May 1975. 1 fig, 9

Descriptors: *Irrigation programs, *Water supply, *Reliability, *Project planning, *Economic efficiency, Irrigation design, Water requirements, Variability, Dependable supply, Storage capacity, Costs, Average income, Computer models.

A brief summary is presented of two computermodel studies and one historical analysis of reservoir-irrigation systems operating under climatic uncertainty. The results indicate that the traditional goal of designing and operating such systems so as to largely eliminate water shortages to farmers can be costly in terms of average annual net revenue foregone. That is, the tradeoffs between system designs which minimise the variance of annual net revenue from the project and very significant. The complexity of the design considerations is emphasised. (CSIRO)
W76-01424 those which maximise annual net revenue may be

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE ROLE OF THE WISCONSIN DEPARTMENT OF AGRICULTURE IN AGRICULTURAL POLLUTION PREVENTION AND CONTROL.

Wisconsin Dept. of Agricultural, Madison. For primary bibliographic entry see Field 5E. W76-01018

RUNOFF CONTROL SYSTEMS FOR CONCRETE DAIRY CATTLE YARDS, Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences. For primary bibliographic entry see Field 5B. W76-01039

FIELD PERFORMANCE OF SELECTED BEEF FEEDLOT WASTE HANDLING SYSTEMS, Illinois Univ., Urbana-Champaign. For primary bibliographic entry see Field 5E. W76-01040.

A CHARACTERIZATION OF THE EFFLUENT FROM COMMERCIAL CATFISH PONDS, Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 5A. W76-01041

BIOLOGICAL TREATMENT OF FEEDLOT RU-NOFF FOLLOWING SETTLING, Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 5D. W76-01042

CATTLE FEEDLOT POLLUTION STUDY, Texas Tech. Univ., Lubbocks. Dept. of Agronomy. For primary bibliographic entry see Field 5E.

ASSESSMENT OF MODELS SUITED FOR THE HYDROLOGICAL ANALYSIS OF URBAN STORM DRAINAGE (A VAROSI CSAPADEK CSATORNAZASI HIDROLOGIAI SZAMITASRA ALKALMAZOTT MODELLEK ERTEKELESE).

Hidrologiai Kozlony, Vol. 52, No. 10, p 443-445, October, 1972. 7 ref.

Descriptors: *Model studies, *Storm runoff, *Urban runoff, Cities, Drainage systems, Computers.

Identifiers: Narayana-Riley model, Tholin-Keifer model

Models for the analysis of urban storm water runoff are evaluated. In its present state, the Rational Formula is not adaptable to urban runoff conditions and must be modified for this specific use. The Tholin-Keifer model, developed originally for Chicago redevelopment programs, can be adapted to other urban conditions since the dimensioning of the drainage system is based on the most probable form of precipitation distribution with respect to time. Finally, the computerized Narayana-Riley model, operating with regression analysis for the determination of relationships between area characteristics and specific runoff load, constitutes a generally applicable design procedure. (Sandoski-FIRL)

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INFILTRATION MODEL WITH REGARD TO THE SURFACE RUNOFF (EIN INFILTRATION-SMODELL UNTER BERUECKSICHTIGUNG DES LANDOBERFLAECHENABFLUSSES), For primary bibliographic entry see Field 2A. W76-01053

MATHEMATICAL MODEL FOR THE FILLING PROCESS OF THE RETENTION BASIN STOEHNA (MATHEMATISCHES MODELL FUER 'EN FUELLVORGANIC DES HOCHWAS ER-RUECKHALTEBECKENS STOEHNA), For primary bibliographic entry see Field 2E. W76-01054

w /6-01034

TOWARDS RATIONAL DRAINAGE DESIGN, A. J. Wilson, and A. L. Britch. Building Science, Vol 8, No 1, p 23-26, March, 1973. 4 fig, 6 ref.

Descriptors: *Model studies, *Sewerage, *Drainage systems, Flow rates, Costs, Pipes, Excavation, Algorithms. Identifiers: Flow estimation.

A simple, rational, and effective algorithm developed for use in estimating flows expected in any sewer drainage system is shown over extensive tests to behave well and give reliable and apparently accurate results which compare very favorably with those obtained by other methods. Comparative results indicate that previous techniques of flow estimation are unnecessarily conservative, and further it is to be expected that use of this approach would result in significant economic benefits since decreased design flow means smaller diameter pipes and decreased gradients necessitating less excavation. At the present time, large scale tests are being planned with the dual purpose of testing the accuracy of the flow predicted by the program and to obtain more accurate empirical data on the discharge characteristics of the different types of equipment upon which the program depends. (Sandoski-FIRL)

CONCEPTUAL MODE DESIGN FOR MOTOR-WAY STORMWATER DRAINAGE, For primary bibliographic entry see Field 2A. W76-01062

EFFECTS OF INUNDATION PERIOD ON SEEDLING GROWTH,
Texas A and M Univ., College Station. Dept. of

Agricultural Engineering.

T. A. Howell, and E. A. Hiler.

Transactions of the ASAE (American Society of Agricultural Engineering). Vol. 17, No. 2, p. 286-288.

Agricultural Engineers) Vol 17, No 2, p 286-288 and 294, March-April 1974. 5 fig, 1 tab, 11 ref.

Descriptors: *Drainage effects, *Drainage practices, Drainage, Crop response, Corn, Cotton, Grain sorghum, Lysimeters, Aeration, *Flooding, *Plant growth, Flood damage, Submergence, Wetting.

Identifiers: Peas, Seedling growth, Inundation.

In considering the necessary steps for proper agricultural drainage design, the logical first step is the determination of the crop's drainage requirement. Rindings concerning effects of inundation period on soil oxygen diffusion rates and crop response during the seedling growth of four selected plant species are presented. Corn, cotton, grain sorghum, and southern pea plants were grown for 30 days in field lysimeters which were inundated for periods of 2, 5, and 8 days, starting approximately 1 week after emergence. Undisturbed soil cores which were 90 cm in diameter and 180 cm deep made up the lysimeters. Rainfall was kept off the lysimeters with an automated shelter system. Oxygen diffusion rate and soil

water pressure potential measurements were made in the crop root zone on a regular basis. Primary crop response measurements included crop height during the growing season and dry matter yield at the end of the growth period. Water was added at the soil surface to maintain the soil water pressure potential in the crop root zone between -10 and -20 centibars, and hence prevent crop water stress, during periods when no flooding occurred. (Skogerboe-Colorado State) W76-01084

MODELING INFILTRATION AND REDISTRIBUTION OF SOIL WATER DURING INTERMITTENT APPLICATIONS,

Minnesota Univ., St. Paul. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 2G. W76-01085

AUTOMATED VALVES FOR SURFACE IR-RIGATION PIPELINES, Agricultural Research Service, Kimberly, Idaho.

Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center. A. S. Humpherys, and R. L. Stacey. Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 101, No IR2, p 95-109, June, 1975. 15 fig, 3 ref, append.

Descriptors: "Hydraulic valves, "Distribution systems, "Irrigation engineering, "Surface irrigation, "Flow control, Automation, Irrigation systems, Pipes, Water distribution(Applied), Irrigation practices, Irrigation design, Irrigation operation and maintenance, Conveyance structures, Irrigation, Water delivery, Operating costs, Water control, Irrigation efficiency, Design criteria.

Automatic irrigation valves have been developed to control the discharge from a field pipeline turnout into either gated pipe or directly into irrigation borders, Design information for 6-inch, 8-inch and 10-inch valves is given. Two types of water-inflatable bladders are used to open and close the valves which are designed to operate with water from the irrigation pipeline at pressures up to approximately 12 pounds per sq inch. Small 3-inch pilot valves, operated by a 3 volt de battery powered motor, are used to control opening and closing of the irrigation valves. This motor/pilot-valve unit can be used with mechanical and electronic timers, commercial irrigation controllers, or radio transmitter/receiver units. (Robinett-Arizona)

INTERACTION OF CALCIUM AND 2,4-D ON EURASIAN WATERMILFOIL,
Tennessee Valley Authority, Muscle Shoals, Ala.

Tennessee Valley Authority, Muscle Shoals, Ala. Environmental Biology Branch. R. A. Stanley

Weed Science, Vol 23, No 3, p 182-184, 1975. 3 fig, 1 tab, 34 ref.

Descriptors: *Calcium, *Herbicides, *2,4-D, Root systems, Growth rates, Inhibition, Hardness(Water), Tennessee, Rates of application, Aquatic weed control.

Identifiers: Eurasian watermilfoil.

The effect of calcium on treatment of Eurasian watermilfoil (Myriophyllum spicatum) with 2,4-D was determined. Shoot and root growth and length were inhibited less by 2,4-D in soil lacking calcium. With 30-day exposures to 2,4-D, calcium had to be added to distilled water in concentrations corresponding to those in hard water to produce maximum herbicidal responses. At lower calcium levels, equivalent to soft water, herbicidal response was about the same as in distilled water. When watermilfoil was exposed to 2,4-D for two days, then grown in hard water so uptake and growth were temporarily separated, root inhibition was proportional to calcium chloride concentra-

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tion during 2,4-D uptake. As little as 0.1 mM calcium chloride facilitated growth inhibition by 2,4-D. Differences in field treatment effectiveness were calculated to be 48% greater at the highest natural calcium concentrations than at the lowest calcium concentrations in water of the Tennessee Valley. Effective field treatment rates with 2,4-D could be varied over a two-fold range depending on calcium concentration at time of treatment. Water samples should be analyzed for calcium before treatment and rate of application adjusted accordingly. (Buchanan-Davidson-Wisconsin) W76-01141

FLOODS IN EASTERN LAJAS VALLEY AND THE LOWER RIO LOCO BASIN, SOUTHWESTERN PUERTO RICO, Geological Survey of Puerto Rico, San Juan. For primary bibliographic entry see Field 2E. W76-01182

FLOODS IN LOMBARD QUADRANGLE, IL-LINOIS, Geological Survey, Champaign, Ill. For primary bibliographic entry see Field 2E. W76-01183

FLOODS IN THE CAROLINA-RIO GRANDE AREA, NORTHEASTERN PUERTO RICO, Geological Survey of Puerto Rico, San Juan. For primary bibliographic entry see Field 2E. W76-01185

MAP SHOWING FLOOD-PRONE AREAS, GREATER DENVER AREA, FRONT RANGE URBAN CORRIDOR, COLORADO, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 2E. W76-01186

MAP SHOWING FLOOD OF APRIL 1975 AT EAST LANSING, MICHIGAN, Geological Survey, Lansing, Mich. For primary bibliographic entry see Field 2E.

MAP SHOWING FLOOD OF APRIL 1975, LANSING, MICHIGAN, Geological Survey, Lansing, Mich. For primary bibliographic entry see Field 2E. W76-01189

MAP SHOWING FLOOD OF APRIL 1975 AT WILLIAMSTON, MICHIGAN, Geological Survey, Lansing, Mich. For primary bibliographic entry see Field 2E. W76-01190

COMPUTER PROGRAM FOR DRAINAGE QUANTITIES, For primary bibliographic entry see Field 4C.

W76-01285

ADAMS COUNTY SURFACE WATER RESOURCES, Illinois Dept. of Conservation, Springfield. Div. of Fisheries. For primary bibliographic entry see Field 7C. W76-01317

HENDERSON COUNTY SURFACE WATER RESOURCES, Illinois Dept. of Conservation, Springfield. Div. of Fisheries.
For primary bibliographic entry see Field 7C. W76-01318

APPROACHES TO MULTIOBJECTIVE PLANNING IN WATER RESOURCE PROJECTS, Virginia Polytechnic Inst. and State Univ., Blacksburg. School of Business Administration.

Blacksburg. School of Business Administration. For primary bibliographic entry see Field 6A. W76-01335

MODELING OF FUTURE EXPENDITURES FOR PLANNING AND ECONOMIC EVALUATION OF ALTERNATIVES, For primary bibliographic entry see Field 6A.

EFFICIENT SEQUENTIAL OPTIMIZATION IN WATER RESOURCES, Iowa Univ., Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 6A. W76.01338

THE ECONOMIC EFFICIENCY OF INTERBASIN AGRICULTURAL WATER TRANSFER IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
J. E. Keith, J. C. Andersen, and C. G. Clyde.
Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-001-076. \$6.00 in paper copy, \$2.25 in microfiche AD/A-001 076. Supp 3 to IWR Contract Report 74-4, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, June 1973. 136 p. 21 fig, 15 tab, 40 ref, 8 equ., 5 append.

Descriptors: *Inter-basin transfers, *Economic efficiency, *Utah, *Water supply, *Water allocation(Policy), *Water resources development, *Alternative planning, *Long-term planning, Regional analysis, Marginal costs, Value, Water policy, Computer models, Demand, Net profit, Investment, Constraints, Equations, Systems analysis, River basins, Municipal water, Industrial water, Optimization.

Identifiers: *Agricultural water, Profit maximization, Mathematical programming.

This paper examines the efficient allocation of water in Utah in time frames up to 2020 under various alternative assumptions and calculates the cost of alternative policies. Using mathematical programming, a computer model is developed to determine the supply (marginal cost) and demand (value of marginal product) relationships for agricultural water, given depletions for municipal and industrial (MandI) and wetland requirements. The model maximizes net profit per acre to an average agriculturalist in each of ten study areas in Utah. Proposed interbasin transfers and their costs are included in supply. The optimal solution generated is an efficient allocation, since maximization of net profits occurs only when value of marginal product equals marginal cost. The requirements for MandI water are projected into the future using trending and probable industrial development. Using alternative assumptions about policies (minimum inflows to Great Salt Lake and water salvage), several alternative temporal distributions are determined. The critical factor in large proposed water transfers in Utah appears to be the growth of MandI requirements along the Wasatch Front, particularly in the Jordan River Basin. Sufficient water is available in the Colorado River Basin to provide maximum transfers, full oil shale and power generation development, and efficient agricultural production. Restrictions on groundwater pumping and water salvage in the Jordan River Basin and maintenance of high inflows to Great Salt Lake make earlier transfer necessary. (Bell-Cornell) W76-01341 ENVIRONMENTAL RECONNAISSANCE
TECHNIQUES FOR CONNECTICUT RIVER
BASIN WATERSHEDS,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 4D.
W76.01344

NONSTRUCTURAL MEASURES FOR FLOOD PLAIN AND FLOOD DAMAGE MANAGEMENT, WITH APPLICATION TO THE CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY, Cheney, Miller, Ellis and Associates, Inc., Put-

nam, Conn. For primary bibliographic entry see Field 6F. W76-01345

LAND-CAPABILITY CLASSIFICATION OF THE LAKE TAHOE BASIN, CALIFORNIA-NEVADA, A GUIDE FOR PLANNING, Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station. R. G. Bailey.

Prepared in cooperation with the Tahoe Regional Planning Agency, 1974. 33 p, 13 fig, 1 map, 66 ref, append.

Descriptors: *Land classification, *Land use, *Land development, *Land management, *Soil types, Erosion, Drainage, Hydrologic properties, Geomorphology, Planning. Identifiers: *Lake Tahoe(Calif), *Lake Tahoe(Nev).

Since the late 1950's the Lake Tahoe Basin, covering 500 square miles, has been subjected to rapid development which has been responsible for many improper land development procedures, including failure to recognize hydrologic and topographic limitations, unnecessary destruction of vegetal cover, realignment and pollution of streams, en-croachment on flood plains, and disruption of drainage. This study classified the land according 'land tolerance' as a measure of capability which is defined as a level of use an area can tolerate without sustaining permanent damage through erosion and other causes. The capability classes are estimated by the degree to which potential hazards arising from improper use are absent. Principal factors used in distinguishing the seven land capability ranks shown on the final map were: Soil Type (along with erosion hazards, hydrologic-soil group, soil drainage and rockiness and stoniness); and Geomorphic Setting including 6 groups: glaciated granitic uplands, glaciated vologroups, graciated grantic uplants, graciated vo-canic flowlands, streamout grantic mountain slopes, streamout volcanic flowlands, depositional lands, and oversteeped slopes. The 7 classes fall into 3 general categories each with implications for land use: High hazard lands, lands that should remain in their natural condition; moderate hazard lands, lands that are permissive to certain uses but not others; and low hazard lands, lands that are most tolerant to urban-type uses. In addition each of the classes is given a single numerical index indicating the percentage, ranging from 1 to 30 percent, of the land which can be used for impervious cover if environmental balance is to be maintained. (Smith-North Carolina) W76-01346

PRIORITIES IN WATER MANAGEMENT. Victoria Univ. (British Columbia). Dept. of Geography. For primary bibliographic entry see Field 6B. W76-01347

ENVIRONMENTAL HAZARDS OF LARGE SCALE WATER DEVELOPMENTS, Geological Survey, Raleigh, N.C. For primary bibliographic entry see Field 6G. W76-01348 BENEFIT-COST ANALYSIS AND MULTIPLE-PURPOSE RESERVOIRS: A REASSESSMENT OF THE CONSERVATION AUTHORITIES' BRANCH DEER CREEK PROJECT, ONTARIO, University of Western Ontario, London. For primary bibliographic entry see Field 6B. W76-01349

NEW STRATEGIES FOR WATER RESOURCE PLANNING AND MANAGEMENT, Johns Hopkins Univ., Baltimore, Md. S. H. Hanke, and R. K. Davis. In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 117-139, 4 tab, 19 ref. 1974.

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Descriptors: *Water control, *Water management(Applied), *Water costs, *District of Columbia, *Water demand, *Pricing, *Potomac River, *Droughts, Water distribution(Applied), Administration, Non-structural alternatives, Water supply development, Cost-benefit analysis, Pumping, Model studies.

Model studies.
Identifiers: *Washington, D.C., Estuary pumping, Drought losses, Minimum storage system, Department of the Interior's 1980 system, Council of Government's Board of Engineers' 2010 system, Seasonal models.

Using the District of Columbia metropolitan area, Using the District of Columbia metropolitan area, this paper analyzes problems of water resource planning and management in terms of incremental costs and values and investigates pricing policy as an alternative to technical solutions. Four proposed storage systems in the Potomac River Basin made up of different components and producing drought protection of various kinds and degrees were tested for hydraulic performance. Total annual costs were estimated as follows: minimum storage plus acceptance of some drought losses, \$1.7 million; minimum storage plus estuary pumping to meet moderate drought conditions, \$.54 million; Department of Interior 1980 plan for average withdrawal plus some peaking capacity of flow to estuary, \$2.6 million; Council of Govern-ments 2010 plan for daily withdrawal plus peaking capacity in July and August, average estuary flow. \$5.1 million. Under the 1980 and 2010 systems, cost apportionments faced by local governments are so small that local policy-makers can officially advocate a larger system than can be economically justified. Preferred allocation of costs assigns costs in direct proportion to benefits received. Projects having local benefits should be paid for by local governments. When costs are not shared with the federal government both of the unconventional minimum storage alternatives (drought losses and estuary pumping) rank ahead of proposed 1980 and 2010 projects in terms of real resources that must be foregone to produce any projects. Demand management through seasonal pricing is discussed. In Washington, D.C., seasonal (winter and summer) water rates accu rately reflect the system costs imposed by various users over the year. By implementing these seasonal rates, the proposed investments in capacity could be deferred at a significant saving. (See also W76-01347) (Hufschmidt-North Carolina) W76-01354

WATER MANAGEMENT AND PRICING POLI-CIES IN ENGLAND AND WALES, London School of Economics and Political Science (England). For primary bibliographic entry see Field 6B. W76-01356

MANAGEMENT OF THE INTERNATIONAL GREAT LAKES, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 6E. W76-01358 THE ROLE OF THE ACADEMIC IN WATER RESOURCES POLICY-MAKING: THE TIJUANA RIVER, A CASE STUDY, California State Univ., San Diego.
For primary bibliographic entry see Field 6B.
W76-0135

SPECIAL FLOOD HAZARD REPORT: CAMP-BELL CREEK, GREATER ANCHORAGE AREA.

Army Engineer District, Anchorage, Alaska. Prepared for the Greater Anchorage Area Borough, May, 1975. 18 p, 28 plates, 3 tab.

Descriptors: *Floods, *Flooding, *Flood flow, *Flood forecasting, *Flood profiles, Surface runoff, Peak discharge, Bank erosion, Flood damage, Ice jams, Glaciation, Warning systems, Control structures, *Alaska, Floodways.
Identifiers: Anchorage(Alaska), Greater Anchorage Area Borough(Alaska), Campbell Creek(Alaska), Little Campbell(Alaska), Intermediate Regional Flood.

The area covered in this report has a drainage area of 126 sq mi and includes the main stem of Campbell Creek, the north and south forks of Campbell Creek to the military reservation boundary, and Little Campbell Creek to the foothills of the Chugach Mountains. Continuing commercial and extensive residential development of the area is contributing to the danger of flooding by removing vegetation (which formerly reduced runoff) and necessitating the construction of culverts which tend to clog during flood conditions. The Greater Anchorage Area Borough has a program for installing larger culverts in troublesome areas, a flood warning system, and a zoning ordinance which is under consideration. Flooding can occur during any season. Winter flooding results from snowmelt and ice conditions; summer floods result from heavy rainfall. An Intermediate Regional Flood on Campbell Creek would have a peak discharge of 1320 cubic feet per second with channel velocities of up to 10 ft/sec and overbank flows of less than 3 ft/sec. Damage from an IRF could include broken water lines, bank erosion, and the effects of floating debris. Flood profiles include a hydraulic floodway added to limits of the IRF. (Henley-North Carolina)

FLOOD PLAIN INFORMATION: ALISO CREEK, ORANGE COUNTY, CALIFORNIA. Army Engineer District, Los Angeles, Calif. Prepared for Orange County Flood Control District, March, 1973. 35 p, 26 fig, 42 plates, 6 tab.

Descriptors: *Floods, *Flood profiles, *Flood data, *Flood plains, Runoff, Flood flow, Streamflow forecasting, Peak discharge, Flood peak, Flood damage, Stream erosion, Bank erosion, Obstructions to flow, Zoning, Channel improvement, *California.

"California Index Editing, Chairing improvements of Creek(Calif), Wood Canyon Creek(Calif), Sulphur Creek(Calif), English Canyon Creek(Calif), *Orange County(Calif), Standard Project Flood, Intermediate Regional Flood.

Properties along the streams in the vicinity of Laguna Hills studied are primarily agricultural and have been moderately damaged by floods in January and February 1969. Extensive open spaces in the flood plains are now under pressure for future development. Orange County has adopted a flood plain zoning ordinance regulating areas subject to flooding. Large floods have occurred in the past and studies indicate that even larger floods are possible. The drainage area of Aliso Creek is approximately 36 miles and the slope of the creek is 125 feet/mile upstream from the study area and about 25 feet/mile downstream, nearer to the Pacific Ocean. Streamflow data have been available since 1932. Most flooding has been

caused by high-intensity rainfall associated with general winter storms. Annual precipitation over the basin averages 15 inches, with major portion between December and March. Extreme peaks can be reached in a matter of hours, rising from nearly dry streambeds. Most of the 12 public bridges and culverts crossing the stream would be obstructive to the Intermediate Regional Flood and even more obstructive to the Standard Project Flood. The most destructive flood on record, that of February 1969, caused damage estimated at \$604,000 to mainly roads and bridges and agricultural land. This flood has a discharge of 2500 cfs. It is estimated that an Intermediate Regional Flood would have a discharge of 3800 cfs and a Standard Project Flood would have a discharge of 7500 cfs measured at the streamflow gage. (Smith-North Carolina)

SPECIAL FLOOD HAZARD INFORMATION: BEAR AND EVANS CREEKS, REDMOND AND VICINITY, WASHINGTON.

Army Engineer District, Seattle, Wash.
Prepared for the City of Redmond and King County, Wash., November, 1970. 8 p. 12 plates.

Descriptors: *Flood plains, *Flood damage, *Flood profiles, *Flood data, Land use, Planning, Peak discharge, Obstruction to flow, Flood plain zoning, *Washington, Urbanization.

Identifiers: Bear Creek(Wash), Evans Creek(Wash), Cottage Lake Creek(Wash), Seattle(Wash), Intermediate Regional Flood, Flood plain management.

Bear Creek and its two principal tributaries, Evans and Cottage Lake Creeks, have well-defined channels through the study reach near Redmond, Washington, except in the extreme upper reach of Evans Creek. Moderately rolling semiforested side hills border the irregular valleys. The lower section of the Bear Creek-Evans Creek valley is used primarily for farming. Further upstream principal development is residential. Because of the area's proximity to Seattle, future expansion pressures are certain to prevail throughout the basin. Flood season is from October to March. Melting snow may augment rainstorm flooding. There are 43 bridges in the study area where debris may collect and increase extent of flooding. The largest recorded streamflow at the gaging station at Bear Creek occurred in March, 1950, at 654 cfs; at Evans Creek in January, 1956, at 132 cfs. Intermediate Regional Flood (IRF) discharges were determined from an analysis of past floods and include an adjustment to reflect anticipated future, 40% development of Bear Creek Basin. At the confluence of Bear and Evans Creeks, IRF peak discharge would be 1450 cfs. Flood occurrences greater than the IRF were not investigated. (Dicfendorf-North Carolina)

FLOOD PLAIN INFORMATION: EIGHT MILE CREEK, VICINITY OF PARAGOULD, ARKANSAS.

Army Engineer District, Memphis, Tenn.
Prepared for the City of Paragould, August, 1971.
31 p, 11 fig, 14 plates, 3 tab.

Descriptors: "Flooding, "Flood flow, "Flood water, "Flood forecasting, "Flood profiles, "Flood peak, "Peak discharge, Historic floods, Storms, Flood frequency, Flood damage, Creeks, Flow duration, "Arkansas.

ration, *Arkansas.
Identifiers: Paragould(Ark), Greene County(Ark),
Eight Mile Creek(Ark), Standard Project Flood,
Intermediate Regional Flood.

The portion of Eight Mile Creek covered in this report has a reach length of 9.65 miles and drain 168 square miles in the areas of Paragould, located on the eastern slope of Crowley's Ridge in northeast Arkansas. Commercial, industrial, and residential

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development in the flood plain is susceptible to flood damage. Duration of flooding can be expected to be relatively short. In this study area the creek has a slope of 7.5 ft/mile. There are no flood control measures or flood warning systems. Flood control improvements on Eight Mile Creek will be considered as a part of the St. Francis River Basin study. Information gained from newspaper files and local residents indicates that large floods on Eight Mile Creek in the Paragould Vicinity have occurred in 1937, 1945, 1957, and 1969. The flood in January, 1969 caused extensive damage (\$1 million) to some business concerns and resulted in the evacuation of some 25-30 families. An Intermediate Regional Flood on Eight Mile Creek can be expected to flow at 10,800 cfs at the lower study limit with velocities of 5.8 and 1.7 feet per second in the channel and overbank areas, respec-tively, and reach a height 0.7 to 1.5 ft higher than 969 flood. A Standard Project Flood will flow at 27,700 cfs at lower study limit with velocities of 8.1 and 2.4 ft/second in the channel and overbank areas, respectively, and reach a height from 2.2 to 4.3 ft higher than the 1969 flood. (Henley-North Carolina) W76-01364

FLOOD PLAIN INFORMATION: PART I BAYOU BARTHOLOMEW AND TRIBUTARIES. CITY OF PINE BLUFF, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
Prepared for the City of Pine Bluff, Arkansas, November, 1973. 28 p, 15 fig, 25 plates, 8 tab.

Descriptors: *Floods, *Indirect flood measurement, *Flood stages, Flood flow, *Plooding, *Flood forecasting, *Flood profiles, Historic floods, Storms, Flood data, Flood peak, Peak discharge, Flood damage, Warning systems, Control structures, *Arkansas, Canals.

Lantificare Pine **Rinfif(Ark)** Infereson Coun-

Identifiers: Pine Bluff(Ark), Jefferson County(Ark), Bayou Bartholomew(Ark), Ouachita River(Ark), Standard Project Flood, Intermediate Regional Flood.

Development in the flood plains of Bayou Bartholomew and its tributaries, Nevins Creek, Pine Bluff, Outlet Canal, Interceptor Canal, Harding Drain, and Boggy Bayou, includes residential, agricultural, industrial and commercial uses. Development of these flood plains is expected to be minor because there is adequate land for these uses outside the flood plain. The drainage area covered in this report consists of 86 square miles with stream slopes ranging from 3.5 ft/mi in the hill areas to .5 ft/mi in the alluvial valley. Streamflow data were measured by 4 gages in the Bartholomew Bayou study area. Prolonged periods of rain in winter and spring and thun-derstorms in the summer months create flooding. Heavy vegetation and many of the 98 bridges which cross streams in the area are capable of ob-structing flood flows. On Bayou Bartholomew, the Intermediate Regional Flood would have a peak discharge of 7,130 cfs, channel velocities of up to 6 ft/sec, with flooding of residential, commercial, and industrial sectors of Pine Bluff. A Standard Project Flood would have a peak discharge of 17,200 cfs. Flood control measures include buildg the Interceptor Canal, enlarging of the Pine Bluff Outlet Canal in 1954, and maintaining an on-going program of clearing existing ditches, drains, and culverts. There are no city or county zoning ordinances or building codes specifically intended to reduce flood damage. Flood control problems will receive attention as part of a Water Management Study presently being undertaken by the Corps of Engineers. (Henley-North Carolina) W76-01365

SPECIAL FLOOD HAZARD INFORMATION: WOLF LODGE CREEK AND TRIBUTARIES, VICINITY OF COUER D'ALENE, IDAHO. Army Engineer District, Seattle, Wash. Prepared for Kootenai County, Idaho, December, 1971. 8 p, 1 fig, 8 plates.

Descriptors: *Flood plains, *Planning, *Flood plain zoning, *Floodway, Erosion, Flood damage, Obstruction to flow, Flood profiles, Flood data, Land use, *Idaho, Flood stages, Lake stages.
Identifiers: Wolf Lodge Creek(Idaho), Kootenai
County(Idaho), Coeur d'Alene Lake(Idaho), Wolf Lodge Bay, Flood plain management, Inter-mediate Regional Flood.

This report is intended to provide the basis for further study and planning by Kootenai County to minimize damages caused by flooding of Wolf Lodge Creek. The well-defined creek drains forested foothills and empties into Wolf Lodge Bay, an arm of Coeur d'Alene Lake. In the steeper Bay, an arm of Coeur d Alene Lake. In the steeper reaches it carries a heavy load of gravel. Spring is the major flood season. Floods are caused primari-ly by melting snow, and some are augmented by heavy rains. There are numerous natural and manmade obstructions to flood flow. At the mouth made obstructions to flood flow. At the mouth, peak discharge of an Intermediate Regional Flood would be 4250 cfs and channel velocities would range from i to 10 feet per second. The higher velocities are sufficient to cause bank erosion. Coeur d'Alene Lake affects stream stages on the lower 1.7 miles of the creek. Maximum flooding conditions occur when the lake stage is high at the time of peak flows on the creeks. The flood plain is used primarily for farming, although there is some residential development, including a trailer park which is subject to inundation. Recommended are utilization of land use zoning measures and establishment of a hydraulic floodway and flood-way fringe. (Diefendorf-North Carolina) W76-01367

FLOOD PLAIN INFORMATION: POCOSHOCK AND POCOSHAM CREEKS, CITY OF RICHMOND AND CHESTERFIELD COUNTY, VIRGINIA.

Army Engineer District, Norfolk, Va. Prepared for Chesterfield County, Virginia, July, 1971. 41 p. 10 fig, 8 plates, 12 tab.

Descriptors: *Floods, *Flooding, *Flood profiles, Flood plain, Flood control, Flood protection, Water management(Applied), *Virginia. Identifiers: Pocoshock Creek(Va), Pocosham Creek(Va), Richmond(Va), Chesterfield County(Va), Intermediate Regional Flood, Standard Project Flood.

Pocosnock Creek flows into Falling Creek about 6.4 miles from the confluence of Falling Creek with the James River. Pocosham Creek, a tributary, flows into Pocoshock Creek at about river mile 0.9 on Pocoshock Creek. Average slopes on Pocoshock and Pocosham Creeks are 19.2 feet per mile and 34.7 feet per mile respectively. Only a small amount of residential development lies on the flood plain. There is no record of houses being flooded. The main flood season is during the summer and fall resulting from intense local thunderstorms or tropical storms. Also, flooding oc-curs in any season from combination of heavy rainfall lasting several days and the increased runoff resulting from development of the drainage area. Primary obstructions to flow include bridges, highway fills and natural obstructions. No flood control measures exist except for a county-required flood study before approving subdivision and site development plans. No stream flow records exist, therefore flood data were determined by highwater marks and personal interviews. Most recent flood was in August, 1969. An Intermediate Regional Flood (IRF) would be 4 to 6 feet higher than the August 1969 flood while a Standard Project Flood would be 1 to 5 feet higher than an IRF. (Salzman-North Carolina)

FLOOD PLAIN INFORMATION: CASPER, WYOMING, VOLUME III, NORTH PLATTE

Army Engineer District, Omaha, Nebr. Prepared for City of Casper, Wyoming, March, 1973. 27 p, 16 fig, 13 plates, 5 tab.

Descriptors: *Flood plain, *Flood control, *Flood protection, *Flooding, *Flood profiles, *Flood forecasting, *Wyoming, Flood frequency, Histor-

Identifiers: Casper(Wyo), *North Platte River(Wyo), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

Within the 19.8-mile study reach of the North Platte River at Casper, Wyoming, there has been no severe flood recorded, but the potential for a highly destructive flood exists. Development has been allowed to locate in the flood plain since the original settlement of the area and present flood plain development includes all types of land use in the various municipalities. Past floods have not created substantial damage at Casper due to the large channel capacity, the minimal use of low grounds adjacent to the stream, and the absence of a major flood-producing storm. June, 1931 was the major flood of record in excess of the 7000 cfs channel capacity, with a peak discharge of 12,700 cfs. Flows at Casper are partially regulated by three reservoirs, and additional damage protection is provided by establishment of flood channel zoning in Casper. Flood projections include the Inter-mediate Regional Flood (IRF) with a peak discharge of 14,400 cfs and the Standard Project Flood (SPF) with a corresponding peak discharge of 43,000 cfs at a point downstream of Casper Creek. The IRF constitutes a relatively small damage hazard with minimal present development in the flood area where all bridges are above the IRF level. The SPF would cause great damage to residential, commercial, industrial, and municipal developments. (Park-North Carolina)

FLOOD PLAIN INFORMATION: ST. JOE AND

ST. MARIES RIVERS, CITY OF ST. MARIES AND VICINITY, IDAHO. Army Engineer District, Seattle, Wash. Prepared for Benewah County and the City of St. Maries, June, 1973. 27 p, 10 fig, 13 plates, 5 tab.

Descriptors: *Flood plains, *Flood plain zoning, *Land use, *Flood profiles, Planning, Flood damage, Flood data, Obstruction to flow, Levees,

damage, Friod and Constitution of how, Levees, Historic floods, *Idaho. Identifiers: St. Joe River(Idaho), St. Maries River(Idaho), St. Maries(Idaho), Flood plain management, Benewah County(Idaho), Intermediate Regional Flood.

The wide fertile flood plain of St. Joe River is intensively farmed with residential, commercial and industrial development, the primary industry being lumber and wood products. The valley of St. Maries River, a major tributary which has its con-fluence with the St. Joe near the city of St. Maries, is narrower and devoted primarily to nonintensive agriculture. Most frequent flooding occurs from snowmelt during the spring. However, the greatest known floods have occurred in the winter and resulted from excessive rainfall and mild temperatures. Floods rise slowly and remain out of banks for a long period. The greatest recorded flood oc-curred December 1933, reaching 2140.8 ft, mean sea level datum, 1 1/2 feet higher than an Intermediate Regional Flood (IRF) is expected to be at the confluence of the 2 rivers. Obstruction caused by 4 bridges and logs stored on the flood plain could increase flood heights. About 17 miles of levees have been constructed along the lower St. Joe, and a 2 1/2 mile long levee and bulk head system protects the city of St. Maries from floods of the magnitude of the IRF. However, flood flows during an IRF would cover a targe portion of the valley including the municipal airport, sewage lagoons, roads, and residences. (Diefendorf-North W76-01370

SPECIAL FLOOD HAZARD REPORT: TO REVISE FLOOD PLAIN INFORMATION, METROPOLITAN REGION, DENVER,

COLORADO; VOLUME II: SAND, TOLL GATE AND LOWER CHERRY CREEKS, SOUTH PLATTE RIVER BASIN.

Army Engineer District, Omaho, Nebr.
Prepared for Denver Regional Council of Governments and Urban Drainage and Flood Controls
District, July, 1971. 21 p, 12 photos, 1 tab, 7 plates.

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Descriptors: *Flood plains, *Flood damage, *Planning, *Dams, *Flood profiles, *Cloudbursts, Land use, Flood data, Historic floods, Obstruction to flow, Urbanization, *Colorado, Levees. Identifiers: South Platte River Basin(Colo), Sand Creek(Colo), Toll Gate Creek(Colo), Cherry Creek(Colo), *Plood plain management, Cherry Creek Dam(Colo), Intermediate Regional Flood, Standard Project Flood.

Cherry Creek channel is alluvial, flat-bottomed, and follows a meandering course, sloping downstream from Cherry Creek Dam at 25 ft/mi, with some channel improvements between the dam and Havana Street. Sand Creek has been improved by channel realignment while portions of Toll Gate Creek improved during interstate highway construction. Cherry Creek study reach is highly urbanized and is crossed by 38 bridges which can obstruct flood flow. Sand Creek and Toll Gate Creek are less urbanized, crossed by 17 and 5 bridges respectively. A zone of frequent cloudbursts over highlands at 6,000 to 7,000 feet covers major portions of these basins. Cloudburst storms cause floods from March through August. The Cherry Creek Reservoir impounded a flood which had a peak inflow of 58,000 cfs in June, 1965, the greatest known are flood, saving an estimated \$130 million in flood damages downstream. At Toll Gate Creek, flow was estimated to be 17,000 cfs, and at Sand Creek it was 18,900 cfs. Their flooding caused extensive damages, destroying nearly every bridge crossing. At the mouths of Cherry, Sand, and Toll Gate Creeks, discharges of an Intermediate Regional Flood would be 10,900 cfs, 49,500 cfs, and 21,900 cfs respectively, and of a Standard Project Flood, 21,200 cfs, 91,200 cfs, and 31,700 cfs. (Diefendorf-North Carolina)

FLOOD PLAIN INFORMATION: PROCTORS CREEK, CHESTERFIELD COUNTY, VIRGINIA.

Army Engineer District, Norfolk, Va. Prepared for the Chesterfield County Board of Supervisors, September, 1973. 26 p, 6 fig, 13 plates, 8 tab.

Descriptors: *Floods, *Flooding, *Flood control, *Flood protection, Flood profiles, Flood plains, *Virginia. Identifiers: *Proctors Creek(Va), Chesterfield County(Va), Standard Project Flood, Intermediate Regional Flood.

Proctors Creek, located in the eastern part of Chesterfield County, south of Richmond, Virginia, flows 7 miles before emptying into the James River. It drains 18.65 square miles and slopes about 21.5 feet per mile. Although channels are clear of vegetation, overbank areas are highly vegetated with trees and brush which would cause obstruction to flood flow. Development in the Proctors Creek flood plain is sparse but it is subject to increasing pressures of growth and development. Although no stream gage record for Proctors Creek exists, data collected from similar streams in the vicinity indicate that floods occur during all seasons, although larger floods resulting from hurricanes occur between May and November. Floods occur from heavy general rainfall and rise to flood peaks in a relatively shortime. The duration of flooding varies from less than a day to a couple of days depending on rainfall duration. No flood damage reduction measuresxist although flood studies are required before approving subdivission and site development plans. The largest flood occurred on July 18, 1945. The latest flood was July 23, 1969. An Intermediate Re-

gional Flood (IRF) and Standard Project Flood (SPF) would inundate much of the flood plain with estimated peak discharges of 10,920 cfs and 18,730 cfs respectively at the mouth. During the SPF, main channel velocities will average about 5.7 ft/sec with 14.8 ft/sec being about the maximum. Overbank flows will average about 2.1 ft/sec with 5.8 ft/sec as a maximum. Slightly lower velocities may be expected for the IRF. (Salzman-North Carolina) W76-01372

FLOOD PLAIN INFORMATION: SAN LORENZO RIVER, BOULDER CREEK-FEL-TON, SANTA CRUZ COUNTY, CALIFORNIA. Army Engineer District, San Francisco, Calif. Prepared for Santa Cruz County, July, 1973. 24 p, 12 fio. 18 Jules. 6 tab.

Descriptors: "Flooding, "Flood profiles, "Flood data, "Historic floods, "Flood stages, "Flood forecasting, Flood flow, Storms, Flood frequency, Peak discharge, Flood peak, Flow characteristics, Bank crosion, Control structures, Levee, Channel improvement, California.

Identifiers: Santa Cruz County(Calif), Santa Cruz(Calif), *San Lorenzo River(Calif), Boulder Creek(Calif), Bear Creek(Calif), Branciforte Creek(Calif), Standard Project Flood, Intermediate Regional Flood.

The portion of San Lorenzo River Basin covered by this report drains an area of 137 square miles located in central Santa Cruz County. Boulder Creek and Bear Creek join the river near the town of Boulder Creek. The terrain is nearly all mountainous and development is chiefly residential, resorts, and service industries. Bridges, culverts and brush can obstruct flood flows. Flooding has the greatest probability of occurring from November to April. In 1959, the Corps of Engineers completed a flood control project on the lower 1.2 miles of San Lorenzo River and on the lower 1.2 miles of its tributary, Branciforte Creek. Three damaging floods have occurred since 1940 with the worst in December, 1955. Peak discharge on the San Lorenzo reached 30,400 cubic feet per second, 388 acres were flooded, 7 lives lost, 2,830 persons displaced and damages estimated at more than \$8,700,900. An Intermediate Regional Flood on the San Lorenzo at Redwoods State Park would reach a peak discharge of 40,000 cfs and would have channel velocities of 8-12 (t/sec. A Standard Project Flood would have a peak discharge of 49,000 cfs at the same location with slightly higher velocities. Overbank flows would average 2-4 ft/sec. (Henley-North Carolina)

FLOOD PLAIN INFORMATION: APTOS, TROUT AND VALENCIA CREEKS, CITY OF APTOS, CALIFORNIA.

Army Engineer District, San Francisco, Calif. Prepared for Santa Cruz County, California, July, 1973. 17 p, 9 fig, 8 plates, 6 tab.

Descriptors: *Floods, *Flooding, *Streamflow forecasting, *Flood profiles, *Flood damage, *Flood plains, Flood flow, Flood data, Peak discharge, Flood peak, Obstruction to flow, *California.

Identifiers: Aptos Creek(Calif), Valencia Creek(Calif), Aptos(Calif), Trout Creek(Calif), Bridge Creek(Calif), Santa Cruz County(Calif), Standard Project Flood, Intermediate Regional Flood.

The properties on the flood plain along Aptos Creek are urban and agricultural. The small Aptos Creek basin is about 24 square miles in area, extending 7 miles into the Santa Cruz Mountains. Aptos Creek and its principal tributary, Valencia Creek, join together at the Town of Aptos (pòpulation 8,704, 1970 census) and drain into Monterey Bay, part of the Pacific Ocean. The streambed slopes from about 8 feet/mile in the

lower reaches to about 300 feet/mile in the upper reaches of the study area. The largest recorded flood occurred in 1963. It reached a peak discharge, as recorded by the streamflow gage installed in 1959, of 2110 cubic feet per second and an elevation of 20.82 feet above mean sea level datum. The bulk of flooding on Aptos Creek has occured from December to March. Floodflow stages can rise to flood peaks in a relatively short period of time with high velocity in the main channels. It is estimated that an Intermediate Regional Flood would have a discharge of 3450 cfs and reach an elevation of 24.3 feet and that a Standard Project Flood would have a discharge of 4400 cfs and an elevation of 25.0 feet. Most of the 8 bridges and culverts in the area would be obstructive to the Intermediate Regional Flood. No flood control works have been constructed on Aptos Creek and there are no zoning ordinances or building codes in effect to prevent flood damage. (Smith-North Carolina) W76-01374

WATER AS A TOOL IN LAND USE CONTROL, LEGAL CONSIDERATIONS: AN EXPLORATO-RY ESSAY, White and Burke. Fort Collins. Colo.

White and Burke, Fort Collins, Colo. For primary bibliographic entry see Field 6E. W76-01393

REGULATION OF GREAT LAKES WATER LEVELS, A SUMMARY REPORT, 1974. International Joint Commission-United States and Canada. Great Lakes Levels Board. 37 p. 40 photo, 6 tab. 7 charts, 1 map.

Descriptors: *Great Lakes, *Surface waters, *Water levels, *Water level fluctuations, High water marks, Low water marks, Elevation, Fluctuation, Lakes, Low flow, Hydraulic gradient, United States, Canada, Governments, Regulation, Water law, Water resources development. Identifiers: International agreements, Water level studies, Water level control.

The Great Lakes are an international resource and an international responsibility. In 1964, because of the prevailing extreme low lake levels and the highs of 1952, the governments of Canada and the United States initiated a joint study of the water levels in the lakes. An International Joint Commission was established pursuant to Article IX of the Boundary Waters Treaty of 1909. Its purpose was to determine whether action would be practicable and in the public interest. Its function was to improve domestic water supplies, sanitation, navigation, water for power and industry, flood control, agriculture, fish and wildlife, and recreation. The International Great Lakes Levels Board was given the task of investigating factors which affect water levels in the Great Lakes. The Board was then to develop ways of controlling water levels, to estimate the costs of activating projects, and to assess the probable effects of the resulting hydrological, economical, environmental, and aesthetic changes. (Proctor-Florida)

SACRAMENTO RIVER BANK PROTECTION PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Sacramento, Calif.

Army Engineer District, Sacramento, Calif. For primary bibliographic entry see Field 8D. W76-01409

ZUMBRO RIVER BASIN, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, St. Paul, Minn. For primary bibliographic entry see Field 8A. W76-01411

BAYOU BODCAU AND TRIBUTARIES, AR-KANSAS AND LOUISIANA ASSOCIATED

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

WATER FEATURES, RED RIVER, BAYOU BODCAU, FLAT RIVER, RED ETC....(FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, New Orleans, La. For primary bibliographic entry see Field 8A. W76-01412

SAINT FRANCIS BASIN PROJECT, ARKANSAS AND MISSOURI, (ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Memphis, Tenn. For primary bibliographic entry see Field 8A. W76-01414

HYDROGRAPH SYNTHESIS USING MATHE-MATICAL MODELS, Wollongong Univ. Coll. (Australia). Dept. of Civil

Wollongong Univ. Coll. (Australia). Dept. of Civi Engineering. For primary bibliographic entry see Field 2A.

PROBLEMS IN THE PROGRAMMED OPTIMISATION OF A HYDROLOGICAL CATCHMENT MODEL,

Commonwealth Scientific and Industrial Research Organisation, Canberra (Australia). Div. of Land Use Research.

For primary bibliographic entry see Field 2A. W76-01420

TRADEOFFS BETWEEN IRRIGATION SYSTEMS WITH DIFFERENT RELIABILITIES OF SUPPLY.

New South Wales Univ., Kensington (Australia).
School of Economics.

For primary bibliographic entry see Field 3F. W76-01424

FLOOD FREQUENCY DISTRIBUTION IN A CATCHMENT SUBJECT TO TWO RAINFALL PRODUCING MECHANISMS,

Queensland Irrigation and Water Supply Commission, Brisbane (Australia). Surface Water Resources Branch.

For primary bibliographic entry see Field 2A. W76-01425

FLOOD WATER ANALYSIS IN THE AREA OF THE TIDAL RIVER EIDER (HOCHWASSERANALYSE IM RAUM DER BIN-NENEIDER), For primary bibliographic entry see Field 2E.

For primary bibliographic entry see Field 2E. W76-01428

PREDICTION OF THE EFFECTS OF THE FLOODWATER OF THE OLONA RIVER IN TICINO (PREVISIONI SUGLI EFFETTI DELLA IMMISSIONS DELLE ACQUE DI PIENE DELL' OLONA IN TICINO),

R. Marchetti, A. Provini, and G. Zambon. Inquinamento, Vol 17, No 6, p 19-33, June, 1975. 14 fig, 13 tab

Descriptors: *Flood control, *Canal construction, Rivers, Water analysis, Flood forecasting, Model studies, Statistical analysis, Overflow. Identifiers: *Olona River(Italy).

A canal is being built for flood control purposes between the Olona River at the village of Rho and the Ticino at Mt. Abbiategrasso (near Milan, Italy), traversing a distance of 24 kilometers, and will handle overflow loads in the Olona exceeding 10 cu m per second. As a consequence of a potential for pollution of the Ticino from pollution problems in the Olona, a sudy was made to determine what effect this would have on the Ticino water, utilizing samplings of the Olona made between 1970 and 1972 at Rho. Using analyses of 77 water samples taken at various times of the year, which included determinations of mineral

and organic particulate, material capable and incapable of sedimentation, oxygen content, BOD, COD, metals, ammonia, pH, anionic detergents, toxicity, eutrophicating compounds, and phosphorus and nitrogen compounds, statistical studies were made. These predict what effects the Olona flood waters would have on the Ticino when the overflow channel is in operation. It was concluded that a negligible amount of self-purification would take place as the Olona water traverses the 24 km length of the canal. (Morrow-FIRL) W76-01447

LONG- AND SHORT-TERM FORECASTING OF RIVER DISCHARGE, (IN JAPANESE),

M. Hino, nd K. Ishikawa. Domiku Gakkai Ronbun Hokokushu, Proceeding of the Japan Society of Civil Engineers, No 236, p 59-70, April, 1975. 15 fig, 4 tab, 9 ref.

Descriptors: *Forecasting, *Rivers, Inflow, Data collection, Flow rate, Flood forecasting, Floods, Rain, Precipitation(Atmospheric), Mathematical studies, Hydrological aspects.

Identifiers: River discharge, Factor analysis, Japan, Typhoon.

Analysis of river discharge variation was carried out for the Sagami River, Japan, by canonical factor analysis. Prediction of long-term river discharge was performed by a reconstruction of several factors. Inflow data at Sagami Dam obtained from 1953 to 1970 showed a constant flow rate of approximately 30 cu m/sec from January to April, and great variation for the periods from the end of june to the beginning of July, mid-August to the end of August, and from mid-September to the end of that month. Drought had a periodicity of three years while severe drought had a periodicity of six years. Flood occurred from the end of June to the beginning of July due to concentrated rain; from mid-August to the end of August due to summer typhoon; and from the end of September to the beginning of October due to fall typhoon. The factors considered included basic analysis independent of the effects of rain and typhoon, seasonal variations, and rain and typhoon factors. W76-01454

CALIFORNIA HIGH WATER, 1973-1974, California State Dept. of Water Resources, Sacramento. Div. of Resources Development. For primary bibliographic entry see Field 2E. W76-01482

STILLWATER RIVER AND ROSEBUD CREEK FLOOD BAZARD ANALYSES, STILLWATER COUNTY, MONTANA. Soil Conservation Service. Bozeman. Mont.

For primary bibliographic entry see Field 2E. W76-01483

BIOLOGICAL CONTROL OF ALLIGATOR WEED,

Office of the Chief of Engineers (Army), Washington, D.C. Aquatic Plant Control Program.
E.O. Gangstad, R. A. Scott, Jr., and R. G. Cason.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-759 500, \$6.75 in paper copy, \$2.25 in microfiche. Technical Report 3, April 1973. 167 p, 7 ref, 4 append.

Descriptors: *Alligatorweed, *Aquatic weed control, *Aquatic insects, *Biocontrol, *Florida, Weed control, Weeds, Aquatic weeds, Aquatic weeds, Aquatic plants, Aquatic life, Floating plants, Biological treatment, Biological communities, Biology, Insects, Southeast U.S., Rivers, Herbicides.

The Agasicles flea beetle is a major contributor to the role that biotic agents play in regulating alligator weed in its native home, and now in certain areas of the United States. The greatest success with the Agasicles as a biocontrol for alligator weed has been at experimental sites in Florida. The increased effectiveness of the alligator weed beetle in this area is believed to be related to the ability of the insect to overwinter. The Agasicles population usually has two peaks of activity in Florida as compared with one in other states. Alligator weed mats present at the beginning of the study reported herein have decreased in size and thickness. Plant competition has played an important role in controlling the alligator weed at the Goose Creek site by Agasicles and at several other sites in the southeastern states. The feeding of the Agasicles on alligator weed decreases its ability to compete with other aquatic plants. Other insects may be used to extend control over a greater geographic area. This report summarized research studies on the aquatic problem plant alligator weed, exploration for its natural enemies, introduction and distribution of insect enemies, and the evaluation of biological control effects. Details of these studies were contained in appendixes. (Sims-ISWS) W76-01495

4B. Groundwater Management

STEADY INFILTRATION FROM LINE SOURCES BURIED IN SOIL, Department of Agriculture, Watkinsville. For primary bibliographic entry see Field 3F. W76-01065

ANHYDROUS AMMONIA APPLICATION IN IRRIGATION WATER VS. MECHANICAL AND ITS EFFECT ON CORN YIELDS, Nebraska Univ., Dept. of Agricultural Engineer-

ing.
For primary bibliographic entry see Field 3F.
W76-01072

ALTERNATE-FURROW IRRIGATION OF FINE TEXTURED SOILS, Southwestern Great Plains Research Center.

Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-01073

SOIL SALINITY DISTRIBUTION IN SPRIN-KLER AND SUBSURFACE-IRRIGATED CITRUS,

Brigham Young Univ., Provo, Utah. S. D. Nelson, and S. Davis.

Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 1, p 140-143, January-February 1974. 4 fig. 3 tab, 4 ref.

Descriptors: *Saline soil, *Salinity, *Sprinkler irrigation, *Subsurface irrigation, *Citrus fruits, Leaching, Irrigation practices, Irrigation effects, Irrigation systems, Irrigation, Agriculture, Irrigation efficiency, Soil-water-plant relationships, Soil salinity.

Identifiers: *Trickle irrigation, *Drip irrigation.

Soil salinity distribution produced by subsurface irrigation results in maximum salt concentrations at the perimeter of the wetting front. The soil salinity increases most in the soil above the burial depth of the subsurface pipe. Winter rainfall could be effectively used to leach accumulated surface salts from the root zone of subsurface-irrigated citrus in southern California, by maintaining a high water content during the rainfall months, allowing precipitation to be used only for leaching and not for increasing the soil water content. By using this management method, a more favorable salt balance was maintained. (Skogerboe-Colorado State)

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4 Effects On Water Of Man's Non-Water Activities-Group 4C

CONTROLLING CENTER PIVOT SPRINKLERS FOR EXPERIMENTAL WATER APPLICATION, Agricultural Research Service, Fort Collins, Colo. For primary bibliographic entry see Field 7B.

FIELD LEACHING BY SPRINKLER AND SURFACE IRRIGATION DURING A CROP SEASON, Agricultural Research Service, Brawley, Calif. Im-

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perial Valley Conservation Research Center. L. F. Hermsmeier, and M. T. Kaddah. Transactions of the ASAE American Society of Agricultural Engineers, Vol 17, No 2, p 275-279, March-April 1974. 4 fig, 5 tab, 1 ref.

Descriptors: *Leaching, Sprinkler irrigation, Surface irrigation, Salinity, Irrigation practices, Irrigation effects, Irrigation operation and management, Irrigation water, Barley, Crop production, Irrigation, Agriculture, Saline soils.

Applying excess irrigation water to a winter barley crop can be used to leach salt from the soil at the same time crop production is proceeding. Surface irrigation and sprinkler irrigation were equally ef-fective in leaching salt from the soil during a barley season. Application of more water between the drains than near the drains with sprinklers im-proved but slightly the salt removal between the drains in the top foot of soil and gave no greater improvement at a depth of 4 to 5 feet. Application of 30% excess water with surface irrigation and 67% excess water with sprinklers produced good barley yields. (Skogerboe-Colorado State) W76-01081

IRRIGATION TIMING BY THE STRESS DAY

INDEX METHOD, Texas A and M Univ., College Station. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 3F. W76-01082

OPTIMIZATION OF WATER USE EFFICIENCY UNDER HIGH FREQUENCY IRRIGATION: II SYSTEM SIMULATION AND DYNAMIC PRO-GRAMMING, Texas A and M Univ., College Station. Dept. of

Agricultural Engineering. For primary bibliographic entry see Field 3F. W76-0108?

HYDROGEOLOGY ALONG THE PROPOSED BARRIER-RECHARGE-WELL ALINEMENT IN SOUTHERN NASSAU COUNTY, LONG ISLAND, NEW YORK,

Geological Survey, Mineola, N. Y. H. F. H. Ku, J. Vecchioli, and L. A. Cerrillo. For sale by USGS, Reston, Va 22092, Price \$1.00. Hydrologic Investigations Atlas HA-502, 1975. 1 sheet, 18 ref.

Descriptors: *Hydrogeology, *Groundwater movement, *Saline water barriers, *Injection wells, *New York, Hydrologic data, Water pollution control, Aquifer characteristics, Maps, Petrology, Subsurface investigations. Identifiers: *Nassau County(NY), Magothy aquifer.

In Nassau County all fresh-water supplies are derived from groundwater sources, of which the Magothy is the principal aquifer. The suitability of the hydrogeologic environment of the Magothy Aquifer is evaluated for development of a hydrau-lic barrier to retard or halt salt-water intrusion into the aquifer. The barrier would consist of a line of wells through which reclaimed water (highly treated sewage-plant effluent) would be injected into the Magothy Aquifer. A summary of the hydrogeology of the Magothy Aquifer and overlying and underlying units in southern Nassau County is tabulated and pertinent data are shown on a hydrogeologic map. The proposed location of the recharge barrier, about 1 mile south of Sunrise Highway, seems reasonable in that it: (1) is south of any public-supply wells that tap the Magothy Aquifer and (2) is within that part of the Magothy Aquifer confined by overlying Pleistocene clay units. The confinement provided by the overlying Pleistone clay units would greatly inhibit vertical dissipation of the recharge head beyond the top of the Magothy and would lead to maximum effec-tiveness of the hydraulic barrier. (Woodard-USGS) W76-01184

LAND SUBSIDENCE DUE TO GROUND-WATER WITHDRAWAL IN THE LOS BANOS-KETTLEMAN CITY AREA, CALIFORNIA: PART 1.CHANGES IN THE HYDROLOGIC EN-VIRONMENT CONDUCTIVE TO SUBSIDENCE, Geological Survey, Reston, Va. W. B. Bull, and R. E. Miller.

Supt. of Documents, GPO, Wash., D. C. 20402 Price \$2.05. Professional Paper 437-E, 1975. 71 p, 47 fig, 3 tab, 28 ref.

Descriptors: *Land subsidence, *Groundwater, *Withdrawal, *Hydrogeology, *California, Geology, Aquifer characteristics, Hydrologic data, Pumping, Water wells, Water yield, Water levels, Geomorphplogy, Groundwater mo-Groundwater recharge, Water demand. Identifiers: *Los Banos-Kettleman movement. Area(Calif)

About 500 to 2,000 feet of unconsolidated flood plain, alluvial-fan, lacustrine, deltaic, and marine deposits are compacting at accelerated rates because of man's changes in the hydrologic environment in the west-central San Joaquin Valley, Calif. Groundwater pumping has increased the stresses tending to compact the deposits by as much as 50 percent. Three basic hydrologic units comprise the groundwater reservoir between Los Banos and Kettleman City. An upper-zone aquifer system, 100-900 feet thick, extends from the land surface to the top of the second unit. It is a lacustrine confining clay. The upper zone consists mainly of poorly permeable alluvial-fan deposits derived from the Diablo Range that contain semiconfined water of poor quality. The lacustrine aquiclude, the Corcoran Clay Member of the Tulare Formation, extends beneath the entire study area except for the southwestern part adjacent to the Diablo Range. The third hydrologic unit, the confined aquifer system of the lower zone, supplies about three-fourths of the groundwater pumped and is the zone in which 50-95 percent of the compaction causing the subsidence occurs. The lower zone consists mainly of flood deposits in the northern part, alluvial-fan deposits in the southern part, and diverse continental to marine deposits in the central part of the area. (Woodard-HSGS) W76-01192

UNDERGROUND STORAGE OF TREATED WATER: A FIELD TEST,

For primary bibliographic entry see Field 2F. W76-01253

RESOURCES OF VOLCANIC ISLANDS, A PILOT PROJECT IN THE CANA-

RIES, For primary bibliographic entry see Field 2A. W76-01258

HYDROGEOLOGY OF A PORTION OF THE SAND HILLS AND OGALLALA AQUIFER, SOUTH DAKOTA AND NEBRASKA, South Dakota School of Mines and Technology, Rapid City.

For primary bibliographic entry see Field 2F. W76-01299

STEP-DRAWDOWN TEST ANALYSIS BY COM-

PUTER, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. J. W. Labadie, and OJ J. Helweg. Ground Water, Vol 13, No 5, p 438-444, Sep-tember-October 1975. 5 fig, 3 tab, 17 ref.

Descriptors: *Groundwater, *Turbulent flow, "Water wells, "Optimization, "Computer programs, Aquifer characteristics, Aquifer testing, Turbulence, Drawdown, Well data, Transition flow, Testing, Anlytical techniques, Least squares method, Discharge(Water), Pumping. Identifiers: Step-drawdown test, Step test, Well

loss. Well efficiency, Effective well radius, Pump

Many geohydrologists believe that the step-draw-down test is useful in determining many important characteristics of a well, whereas others altogether question its utility. In addition to this controversy, its application is hindered because the graphical analysis of data is unwieldy. A computer was presented for step-drawdown test analysis which is efficient and simple to use; moreover, it was an example of how optimization could be used in a practical way. A listing of the FORTRAN code was included along with some example calculations. The computer program generates leastsquares fitting to step-test data to produce values of B, C, and P of the drawdown equation BQ plus CQ to the Pth power. (Prickett-ISWS) W76-01300

WATER 'MINING' DECLARED UNLAWFUL UNDER IDAHO GROUND WATER STATUTE. For primary bibliographic entry see Field 6E. W76-01396

THE QUALITY AND TREATMENT OF ARTE-SIAN WATERS IN HUNGARY (A HAZAI MELYSEGI VIZEK KEZELESENEK SZUK-SEGESSEGE ES TECHNOLOGIAJA), For primary bibliographic entry see Field 5F. W76-01453

4C. Effects On Water Of Man's Non-Water Activities

TECHNIQUES QUANTITATIVE EVALUATING THE ENVIRONMENTAL IM-PACT OF TRANSPORTATION SYSTEMS. Sydney Area Transportation Study (Australia). T. R. Mongan, R. S. Nielsen, and N. J. Nielsen. Royal Australian Planning Institute Journal, Vol 11, No 4, p 135-142, October 1973. 9 ref.

Descriptors: *Transportation, *Environment, *Evaluation, Water pollution, Solid wastes, Air pollution, Social aspects, Pollutants, Estimating. Identifiers: *Environmental impact, *Quantitative techniques, Social disruption, Noise pollution, Urban areas.

The size and cost of transportation systems have grown so large and the time periods needed to amortize the investment have become so long that the detrimental effects of these systems on the urban environment are likely to be particularly long-lived. In evaluating a transportation system, it is necessary to weigh the detrimental environ-mental impact of the system against the con-venience and economic stimulation which the system is expected to produce. Most detrimental environmental impacts of transportation systems can be classed as pollution or social disruption. Presented are some methods for preparing quantitative estimates of these two classes of environmental impacts which have been developed for the Sydney Area Transportation Study and appear to be generally applicable. In developing these esti-

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4C-Effects On Water Of Man's Non-Water Activities

mates, two basic questions are posed; (1) What are the actual physical effects of a given system on the environment; and (2) What are the levels at which these effects are undersirable or harmful. The first question, which is a scientific and technical one requiring the assistance of technical specialists to answer it is discussed. (The second question is one of values.) Some of the main emission sources leading to high pollutant concentration in large urban areas are transport related. The emissions from transportation system components can cause air, noise, solid waste, and water pollution; each of these problems is considered at it relates to transport technology. Road, rail, air, and water-borne transport are discussed. (Bell-Cornell) W76-01009

CONCEPTUAL MODEL DESIGN FOR MOTOR-WAY STORMWATER DRAINAGE. For primary bibliographic entry see Field 2A. W76-01062

COMPUTER PROGRAM FOR DRAINAGE QUANTITIES, T. Williams.

Surveyor, Vol 141, No 4207, p 38-41, January 26,

Descriptors: *Model studies, *Computer programs, *Sewers, *Drains, Storm drains.

The majority of road contracts prepared in the United Kingdom conform to the model contract document for highway works contracts of the Department of the Environment. The standardized way in which drainage information has to be presented is particularly suited to the use of a computer which also reduces repetitive error-prone manual operations. A suite of programs has there-fore been written which include KIDD2, BILL, MHOLE, and MHBILL. KIDD2 produces printed output in the form of sewer schedules and gutter schedules, together with punch cards for use as input to BILL. BILL takes as input cards produced from one or more runs of KIDD2 plus any punched manually, and gives a print-out in the form of bill of quantity items. MHOLE uses the same basic card input as KIDD2, yielding printed output in the form of a manhole schedule sorted according to type, together with punched cards for MHBILL. MHBILL accepts cards produced from one or more runs of MHOLE plus any punched manually, and provides print-out in the form of bill of quantity items. The KIDD2 program does the working-up required for sewers and gutter connections. It handles any number of these in the same run by the use of separate subroutines, control being transferred to the appropriate subroutine or returned to the main program by signal cards. The BILL program combines the manual operations of abstracting and billing. It also calculates the average depth and selects the maximum depth for each item. At the same time, it counts the numbers of each kind of gutter connection, and the numbers of junctions of these connections with storm sewers of each size. The purpose of the MHOLE program is to identify each sewer terminal and to calculate and record its name, type, and its depth and volume. The MHBILL program replaces the manual tasks of abstracting and billing, its main function being that of sorting. It uses as input 44-cards output from one or more runs of MHOLE together with any punched manually. (Sandoski-FIRL) W76-01285

URBANIZATION IMPACT ON WATER QUALI-DURING A FLOOD IN SMALL WATERSHEDS,

Wisconsin Univ., Milwaukee, Dept. of Geological Sciences

D. S. Cherkauer.

Water Resources Bulletin, Vol 11, No 5, p 987-998, October 1975. 6 fig, 4 tab, 19 ref.

Descriptors: *Urban runoff, *Water quality, *Streamflow, *Rural areas, *Wisconsin, Peak discharge, Land use, Floods, Suspended solids, Sodium, Chlorides, Calcium, Magnesium, Bicar-bonates, Urbanization, Hydrology. Identifiers: Brown Deer Creek(Wis), Trinity Creek(Wis), Milwaukee(Wis)

The impact of various urban land uses on water flow and quality in streams is being studied by monitoring small streams in the Milwaukee urban area. The responses of an urban watershed and an agricultural watershed to an autumn rainfall of 2.2 cm were compared. Flow from the urban basin showed a substantially greater response to the rain than that from the rural. Dilution, resulting from the greater quantities of surface runoff in the urban watershed, caused lower concentrations of sodius, chloride, calcium, magnesium, bicar-bonate, and total dissolved solids in the urban stream. The total quantity of these materials removed per unit drainage area of the urban basin was much greater, however. Road salt was still among the dominant dissolved materials in the urban water chemistry seven months after the last road salting. Sodium was apparently being released from adsorption by clays in the urban basin. Suspended sediment concentrations and total loads were higher in the urban stream. (Lardner-ISWS) W76-01307

THE ROLE OF THE ACADEMIC IN WATER RESOURCES POLICY-MAKING: TIJUANA RIVER, A CASE STUDY, California State Univ. San Diego. For primary bibliographic entry see Field 6B.

PRIVATELY-OWNED WATER SUPPLY SYSTEMS. Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, Pa. For primary bibliographic entry see Field 3D.

4D. Watershed Protection

NO-TILLAGE SYSTEM REDUCES EROSION FROM CONTINUOUS CORN WATERSHEDS,
Agricultural Research Service, Coshocton, Ohio. For primary bibliographic entry see Field 2J. W76-01078

HYDROLOGY OF BLACK WATERSHEDS, WESTERN COLORADO, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo. E. C. Frank, H. E. Brown, and J. R. Thompson USDA Forest Service, General Technical Report RM-13, June, 1975. 11 p, 8 fig, 6 ref, 4 tab.

Descriptors: *Hydrology, *Watersheds(Basins), *Surface runoff, *Suspended load, Sediments, Water pollution sources, Colorado, Runoff, Sediment yield, Storm runoff, Soil erosion, Precipitation(Atmospheric), Streamflow, Grazing, Water supply, Water quality, Grasslands. Identifiers: Black Mesa(Colorado).

For 11 years, precipitation, streamflow, and sediment were measured from three small watersheds on Black Mesa in the mountain grasslands of western Colorado to obtain information about hydrologic processes. Runoff and suspended sedi-ment data show no relationship to bare soil intercept. This lack of relationship is probably due to the experimental error in measuring these small amounts of sediment. Bare intercept decreased on each watershed during the 1957-1967 period, even though grazing utilized an average of 40% of the grass in the open parks on one of the watersheds. While suspended-sediment concentration after summer storms can be as much as 6 times that sampled during snowmelt, total yield averages 91 lb/acre from spring runoff and 11 lb/acre from storm runoff because of the small volume of flow. Based on current erosion classification schemes. these are very minor amounts of geologic erosion. (Witt-IPC) W76-01233

DETERMINATION OF URBAN WATERSHED RESPONSE TIME. Colorado State Univ., Fort Collins.

E. F. Schulz, and O. G. Lopez No 71, Hydrology Papers, Colorado State University, Fort Collins, Colorado, December 1974, 41 p, 8 fig, 12 tab, 96 equ, 74 ref, 2 append.

*Urban hydrology, *Watersheds(Basins), *Floods, *Unit hydrographs, Storms, Rainfall, Runoff, Networks, Data processing, Correlation analysis, Drainage, Equations, Systems analysis, Planning, Colorado. Identifiers: Stepwise multiple regression, Parameters of urbanization, Lag time, Response time, Denver(Colo), Linear regression.

Urban engineers are plagued by many problems related to hydrology. On e of these is flooding and the design of storm water drainage. Accompanying the frequent flooding are the tendency of the water courses to deteriorate and problems of sedimentarelations between flood hydrograph parameters and physical features unique to the urban watershed. After a review of previous work and a discussion of different methods for quantifying urbanization, a stepwise multiple regression technique was used to select the best parameter of urbanization. The rainfall and flood events from nine urban watersheds in the Denver Metropolitan region were analyzed. Unit hydrographs were derived from the measured floods on these watersheds, and the unit hydrograph parameters were correlated with storm and physical watershed parameters. It was found that the changes in the unit hydrograph in the urban region were related to the decrease in the watershed response time. The best way of defining the response time was the lag time. The lag time was found to be sensitive to the increase in the hydraulic capacity, to the decrease in the ratio of previ-ous watershed, and to the shape of the watershed. (Bell-Cornell) W76-01339

ENVIRONMENTAL RECONNAISSANCE TECHNIQUES FOR CONNECTICUT RIVER BASIN WATERSHEDS, Center for the Environment and Man, Inc., Hart-

ford, Conn.

D. R. Zoellner, and G. M. Northrop. Available from the National Technical Information Service Springfield, Va 22161 as PB-238 497, \$5.00 in paper copy, \$2.25 in microfiche. Prepared for the Connecticut River Basin Program, New England River Basins Commission, Boston, Mas-sachusetts. Final report No CEM 4155-498, March 1974. 96 p, 7 fig, 16 tab, 27 ref, append. CRSS-NERBC 1.6B.

Descriptors: *Watershed management, *River basins, Methodology, *Environmental effects, *Flood damage, Flood protection, Water quality, Flood plains, terns(Geologic), Erosion, Drainage Soils. Sedimentation, Connecticut River. Identifiers: *Ecological profiles, *Environmental impacts, *Connecticut River Basin, Mill River(Mass), Black River(Vt), Northhampton(Mass), Springfield(Vt), Flood management al-

Methods are delineated for performing in a short period of time an environmental reconnaissance of Connecticut River Basin (CRB) watershed, which will result in enough information to assess

the impacts that would raise from various flooddamage reduction alternatives. From the study of the Mill River and Black River watersheds, some general rules are developed for such studies, and research needs are identified. For an adequate study of Connecticut River Basin watershed the following are necessary: (1) an environmental profile that establishes the natural and manmade characteristics, presents a framework for informa-tion and identifies information sources: (2) a tion and identifies information sources; (2) a matrix approach for arraying flood management alternatives against watershed characteristics. Some of the more salient features that determine the present environmental characteristics of streams are: area, topography, climatology, soil conditions, vegetation and urban-rural development; location function and condition of existing man-made impoundments: man-oriented past and present stream uses with emphasis on pollutants; present status of diversity and productivity of stream life. The matrix approach for flood management alternatives lists alternative func-tional activities vertically on the matrix and natural environment characteristic horizontally. The latter consists of Sectors which is a physical category, Elements which are physical subdivisions of the natural sectors, Characteristics of the Elements, and Functional Activities which is the behavior of the entities in carrying out their natural functions. The report lists envrionmental impacts associated with reservoir projects and flood damage reduction projects. (Smith-North W76-01344

SEDIMENT ROUTING FOR AGRICULTURAL WATERSHEDS,

Agricultural Research Service, Temple, Tex. J. R. Williams.

Water Resources Bulletin, Vol 11, No 5, p 965-974, October 1975, 6 tab, 16 ref.

Descriptors: *Sediment yield, *Agricultural watersheds, *Soil erosion, *Settling velocity, *Texas, Sheet erosion, Rill erosion, Gully erosion. Identifiers: *Universal soil loss equation, Sediment routing.

A sediment routing technique was developed to route sediment yield from small agricultural watersheds (less than or equal to 10 sq mi) through streams and valleys to the outlet of large watersheds (less than or equal to 1000 sq mi). The procedure was based on the modified universal soil loss equation and a first order decay function of travel time and particle size. Deposition was dependent upon settling velocities of the sediment particles, travel time, and the amount of sediment in suspension. Sediment routing increases sediment yield prediction accuracy and allows deter-mination of subwatershed contributions to the total sediment yield. Also the locations and amounts of floodplain scour and deposition can be predicted. Another advantage of sediment routing is that measured sediment yield data are not required. The procedure performed satisfactorily in test routings on two Texas blackland watersheds. More tests were planned with data from other physiographic areas. (Bhowmik-ISWS)

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

A CHARACTERIZATION OF THE EFFLUENT FROM COMMERCIAL CATFISH PONDS, Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
D. B. Beasley, and J. B. Allen.
Presented at 67th Annual Meeting, American
Society of Agricultural Engineers, Oklahoma

State University, Stillwater, June 23-26, 1974; Paper No. 74-5004, 28 p. 16 fig, 5 tab, 9 ref.

Descriptors: *Effluents, *Fish farming, *Farm wastes, Water sampling, Ponds, Biochemical oxygen demand, Nutrients, *Chemical analysis, Catfishes, Fish stocking.

Identifiers: *Commercial catfish ponds, Total

This investigation was carried out to obtain a meaningful chemical and biochemical charac terization of the effluent from commercial catfish ponds. The water samples were taken from commercial catfish ponds in both the Mississippi and Arkansas Delta areas. The ponds ranged in size from 10 to 40 acres and the stocking rates included 1800, 2000, and 3000 fish per acre. All of the ponds were sampled on the surface, and one pond at each stocking rate was also sampled at the bottom. This data was arranged in order to compare both the differences in stocking rates and the difference in sampling depths. The water quality in the ponds monitored usually met or exceeded standards set forth for recreational waters by the Mississippi Air and Water Pollution Control Commission. In a majority of cases, the values of most of the parameters obtained from samples taken from the bottom of these ponds was slightly higher than corresponding values obtained from samples taken at the surface. Also, the ponds stocked at higher rates usually had slightly higher values of BOD, nutrients, and total solids. (Cartmell-East Central Oklahoma State) W76-01041

METAL ANALYSIS BY MODEL 630-C HITACHI LIQUID CHROMATOGRAPH (630-C-GATA HITACHI EKITAI KUROMATOGRAPHU NI YORU KINZOKU BUNSEKI),

T. Hamano, and Y. Takata.

Hitachi Hyoron, Vol 55, No 2, p 21-25, February, 1973. 10 fig, 3 ref.

Descriptors: *Analytical techniques, *Heavy metals, Pollutant identification, Saline water, In-dustrial wastes, Potable water, Industrial water, Boiler feed water, Hardness(Water).

Identifiers: Japan, Liquid chromatography, Electrolytic cells. River water.

The Hitachi Company of Japan has developed a new liquid chromatograph, Model 630-C, using stable electric potential coulometry for analysis of heavy metals. In using this apparatus, when the reaction reaches a given point electrolysis of these metals is completed and analysis is quick. Also, selective reactions are possible using electrolytic potential differences, high sensitivity can be expected, an absolute determination of quantity is possible, calibration curves are not necessary, and the results are not affected by the temperature or the consistency of the liquid. The structure of the apparatus is such that the column solution passes through the electrolytic cell, and the elements in the solution complete electrochemical reaction while passing the cell. If the flow speed is stable, the electric current will show the concentration of the material in the solution. By changing the resin packing of the separation column and the column temperature, the position of analysis may be changed in order to avoid overlapping and 5 to 6 elements can be analyzed in 30 to 40 minutes. This method is applicable to heavy metal ions in saline water or river water, for analysis of liquid waste from industries, and hardness analysis of drinking, industrial, or broiler water. (Sandoski-FIRL)

EVIDENCE FOR THE OCCURRENCE OF SPECIFIC IRON (III)-BINDING COMPOUNDS IN NEAR-SHORE MARINE ECOSYSTEMS, Texas Univ., Port Aransas. Marine Science Inst. For primary bibliographic entry see Field 5B. W76-01101

ANODIC STRIPPING VOLTAMMETRY WITH THE FLORENCE MERCURY FILM ELEC-TRODE DETERMINATION OF COPPER, LEAD

AND CADMIUM IN SEA WATER, Oslo Univ. (Norway). Dept. of Chemistry.

W. Lund, and M. Salberg.

Analytica Chimica Acta, Vol 76, No 1, p 131-141,
May, 1975, 5 tab, 5 fig, 17 ref.

Descriptors: *Analytical techniques, *Heavy metals, *Sea water, *Trace elements, Volumetric analysis, Model studies, Electrodes, *Copper, Lead, Cadmium, Mercury. Identifiers: *Voltammetric technique, *Ligands, Complexes.

The determination of trace metals in sea water is an important application of stripping voltammetric technique. Cu, Pb, and Cd were chosen to analyze in a model system for the critical evaluation of the technique. The analyses were carried out at a pH of 8 in the absence of added chemicals, using the rotating glossy carbon electrode mercury plated in situ for anodic stripping voltammetry. The choice of electrode material, effect of instrumental parameters on the stripping response, and sen-sitivity of the complex-forming ligands are discussed. The performance of the film electrode is compared to that of the hanging Hg drop electrode. (Delfiner-Vanderbilt) W76-01105

ANALYSIS OF ARAGONITE FROM THE CUT-TLEBONE OF SEPIA OFFICINALIS L., Hull Univ. (England). Dept. of Geology.

R. A. Hewitt. Marine Geology, Volume 18, No 2, p M1-M5, February, 1975, 3 fig. 10 ref.

Descriptors: *Heavy metals, *Spectrometers, *Marine animals, *Marine biology, Spec-*Marine animals, trophotometry, Analytical *Strontium.

Identifiers: *Septa. *Intracameral *Cuttlebones, *Atomic-absorption flame spec-troscopy, *Aragonite.

Samples of the septa and intracameral walls of cuttlebones from the English Channel was isolated from each other, using a described technique. Rapid analyses of the Sr and Mg content of successive growth increments were performed by atomic-adsorption flame spectroscopy. The results showed that during the winter Sr content is approximately double that of the summer, but similar high values can also occur in summer due to calcium deficiency. (Kemp-Vanderbilt) W76-01108

A NOTE ON THE EFFECT OF CHEMICAL TREATMENTS IN THE MINERALOGICAL

STUDIES OF SEDIMENTS,
McGill Univ., Montreal (Quebec). Marine McGill Univ., Sciences Centre. V. Subramanian

Experientia, Vol 31, No 1, p 12-13, January 15, 1975. 1 fig, 1 tab, 6 ref.

Descriptors: *Heavy metals, *Iron, *Mineralogy, *Sediments, *Radiation, Chemical reactions, Sodium compounds, Pollutant identification, Chemical properties, Clay minerals, Kaolinite, Illite, Montmorillonite, X-ray diffraction, Atlantic

Identifiers: Mossbauer spectra, Velocity-absorption spectra, Metallic coatings, Amazon River.

Changes were observed brought about by chemical pretreatment in the Mossbauer spectra of natural sedimenta samples. X-ray and other analytical tools were used. Sediment samples are commonly treated with Nacitrate, Na-bicarbonate and Nadithionite to remove metallic coatings, and with H2O2 to break up the organics. A sediment sample was collected from the Atlantic Ocean off the mouth of the Amazon River, which consisted of

Group 5A-Identification Of Pollutants

equal amounts of kaolinite, illite, and montmorillonite. Mossbauer effect was observed on both treated and untreated sediment. The data obtained were computer fitted to obtain the velocity-absorption (intensity) spectra. The data indicate that the chemical treatment affects the basic structure of the silicates, in addition to removing some, but not all of the iron in the coatings. It is most likely that the structural changes occur in the montmoril-lonite fraction. These results indicate that the usefulness of chemical pretreatment for mineralogical studies needs to be re-evaluated. (Davis-Van-W76-01109

MEASUREMENT ZOOPLANKTON OF BIOMASS BY CARBON ANALYSIS FOR APPLI-CATION IN SOUND SCATTERING MODELS, Naval Postgraduate School, Monterey, Calif. J. C. Radney

Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-001 294, \$5.50 in paper copy, \$2.25 in microfiche. Master's thesis, September 1974, 122 p. 39 fig, 5

Descriptors: "Measurement, "Zooplankton, "Biomass, "Carbon, "Analytical techniques, Acoustics, Methodology, Sonar, Oceans. Identifiers: LECO Carbon Analyzer, Benzoic acid, Casein, Tigriopus californicus, Monterey Bay(Calif). Sound scattering

Organic carbon analysis is a simple, reliable test of marine organism (zooplankton) biomass. The LECO Carbon Analyzer which employs high temperature dry combustion and a thermal conducting sensor was adapted for determining total carbon Analysis was rapid (70 seconds), consistent (plus or minus 3%) consistent (plus or minus 3%). Less than 71 mg of carbon in benzoic acid or casein could be measured. Biomass measurement using carbon analysis was tested by determining the carbon content in a marine copepod, Tigriopus californicus; the mean carbon content was 38.6% freeze-dried weight. The mean adenosine triphosphate-carbon to total carbon ratio in T. californicus was 0.2634%; this was used to determine living biomass of field net samples. Zooplankton were considered to be indigenous above 200 m and distributed in patches dependent on space and time. Estimates of total, living, and dead biomass by carbon analysis and ATP measurements showed definite seasonal trends in Monterey Bay, California. Standard curves of the LECO Carbon Analyzer should be verified with other standards. Collection and freeze-drying techniques need to be improved. Diurnal and multi-day studies are suggested. Acoustic measurements should be made in the same region to test the application of zooplankton biomass measurements to sound scattering. (Buchanan-Davidson--Wisconsin) W76-01163

BASICS OF POLILITION CONTROL. Gurnham and Associates, Inc., Chicago, Ill. For primary bibliographic entry see Field 5D. W76-01228

BACTERIAL FLORA OF SALINE AQUIFERS, North Carolina State Univ., Raleigh. Dept. of Microbiology. C. J. Willis, G. H. Elkan, E. Horvath, and K. R. Dail.

Ground Water, Vol 13, No 5, p 406-409, September-October 1975. 1 tab, 10 ref. NSF GI-39586

Descriptors: *Bacteria, *Methane bacteria. Analytical techniques, *Aquifers, Microorganisms, Saline water, Chromatography, Sulfur bacteria, Anaerobic bacteria, Actoric bacteria, Pollutant identification, Chemistry, Instrumentation, Methane, Analysis, On-site investigations, Florida, Surface waters, North Carolina, Soils, Pollutants, Observation wells, Sampling, Water pollution, Industrial wastes, Artesian aquifers, Injection wells, Waste disposal, Liquid wastes.
Identifiers: *Bacterial flora, *Saline aquifers,

*Methanogenic bacteria, *Waste injection wells, Microbial populations, Facultative microorganisms, Subsurface storage, Subsurface ecosystems, Biological activity, Desulfovibrio, Flavobacteri-

The bacterial flora of three unpolluted saline aquifers were examined. Aerobic, anaerobic, and facultative microorganisms were isolated and classified to genus. The organisms isolated were those commonly found in surface water and soil. Methanogenic bacteria were present in all aquifers. (Henley-ISWS) W76-01254

WATER RESOURCES ASPECTS OF THE PROPOSED PERKINS STATION NUCLEAR

POWER PLANT.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Water Resources Planning Dept.

For primary bibliographic entry see Field 8A. W76-01274

A METHOD FOR THE DETERMINATION OF TOXICITY OF POLLUTANTS IN WATER AND EFFLUENT TO BACTERIA (EINE METHODE ZUR BESTIMMUNG DER BAKTERIENTOX-IZITAET VON SCHADSTOFFEN IN WASSER UND ABWASSER), R. H. W. Schubert.

Zentralblatt fuer Bakteriologie, Parasitenkunde, Infektionskrankneiten und Hygiene, Abteilung 1: Originale B, Vol 156, No 6, p 545-550, 1973. 1 tab,

Descriptors: *Analytical techniques, *Toxicity, *Bacteria, Effluents, Water, Biochemical oxygen demand, Pollutants.

Identifiers: Mutations, Aeromonas hydrophila.

A spontaneous mutant of Aeromonas hydrophila. a species which is characteristic of the effluentsurface water biotype and is fairly sensitive to toxic substances, has been examined as a method for testing pollutant toxicity to bacterial organisms. In the investigation, mutant growth inhibi-tion by the pollutant in BOD dilution water containing 10 to the minus 5th power percent vitaminfree hydrolyzed casein served as a measure of toxicity. A culture of the mutant in the treated BOD dilution water served as a control. Investigations of samples for toxicity are possible due to the specific properties of the mutant. (Sandoski-FIRL) W76-01292

CHEMISTRY OF MUN-WATER INTERFACE IN AN IMPOUNDMENT,

Illinois State Water Survey, Peoria. Water Quality Section. For primary bibliographic entry see Field 2K. W76-01304

ADAMS COUNTY SURFACE RESOURCES, Illinois Dept. of Conservation, Springfield. Div. of

Fisheries. For primary bibliographic entry see Field 7C. W76-01317

HENDERSON COUNTY SURFACE WATER RESOURCES. Illinois Dept. of Conservation, Springfield. Div. of

For primary bibliographic entry see Field 7C. W76-01318

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS, FEBRUARY 1973

Canada Centre for Remote Sensing, Ottawa (Ontario). Data Acquisition Div. J. N. de Villiers.

J. N. de Villera, Available from the National Technical Informa-tion Service as PB-238 841, \$3.50 in paper copy, \$2.25 in microfiche. Data Report 73-7 (Formerly 73-16), September 1973. 18 p., 7 fig.

Descriptors: *Remote sensing, *Oil spills, *On-site investigations, *Pollutant identification, Aerial photography, Instrumentation, Photography, Water pollution sources, Oil, Infrared radiation, Measurement, Mapping, *Path of pollutants. Identifiers: *Grand Bahamas, Naptha, Louisiana crude oil. Laser fluorosensor.

An airborne exercise employing various sensors to investigate their ability to detect and map Louisiana Crude and Naptha oil spills, both by day and by night, was described. It was shown that photographic, infra-red scanning and low light level T.V. all have some ability to detect Louisiana Crude; only infra-red scanning detected naptha. None of these sensors could identify the anomalies as oil. Sampling the anomaly from a boat or use of other sensing techniques (such as fluoro-sensing) was needed to identify the anomaly positively as oil. A laser fluorosensor showed promise in detecting oil at night. Further development will be needed to explore the full potential of such a technique. (Humphreys-ISWS) W76-01324

A SURVEY FOR THE USE OF REMOTE SENSING IN THE CHEMICAL BAY REGION, Maryland Univ., Solomons. Chesapeak Biological

For primary bibliographic entry see Field 5B. W76-01327

METHODS AND DATA REQUIREMENTS FOR RIVER-QUALITY ASSESSMENT,

Geological Survey, Portland, Oreg. D. A. Rickert, W. G. Hines, and S. W. McKenzie. Water Resources Bulletin, Vol 11, No 5, p 1013-1039, October 1975. 5 fig, 1 tab, 32 ref.

Descriptors: *Water resources, *Management, *River basins, *Water quality, Dissolved oxygen, Communication, Simulation analysis, Mathematical models, Mapping, Systems analysis, Decision making, *Oregon, Environmental

Identifiers: *Environmental impact assessment, Data programs, *Willamette River basin(Oregon).

The U.S. Geological Survey is conducting an intensive river-quality assessment of the Willamette River basin, Oregon. The objectives are to (1) define a practical framework for conducting comprehensive river-quality assessments, (2) develop and document methods for evaluating basin-development alternatives in terms of potential im-pacts on river quality, (3) determine the kinds and amounts of data required to adequately assess various types of river quality problems, and (4) apply the framework, data, and methods to assess the existing or potential river-quality problems of the Willamette River basin. Considered herein are objectives 2, 3, and 4, by examining the rationales behind the selection and application of methods and the design of data programs for assessing specific river-quality problems. The rationales are those developed for assessing (1) the effect of population and industrial growth and resulting waste discharges on river-dissolved oxygen, (2) the potentially harmful effects on land and river quality of accelerated erosion resulting from intenquanty of accelerated erosion resulting from inten-sive land-use development, and (3) the potential for nuisance algal growth. The goal of the assess-ment program and, thus, the context of the ra-tionales is to provide technically sound informa-tion that is appropriate and adequate for resource planning and management. (Bell-Cornell) W76-01334

A SYSTEMS ANALYSIS OF A CONTINUOUS WATER QUALITY MONITORING PROJECT, Tennessee Univ., Knoxville. Water Resources

Research Center. R. E. Cronmiller.

Available from the National Technical Inform Available from the National Technical Information Service Springfield, Va 22161 as PB-246 846, \$4.50 in paper copy, \$2.25 in microfiche. Research Report No 38, August 1974. 9 fig, 6 tab, 7 ref, 53 p. OWRT A-022-TENN(1).

Descriptors: *Water quality, *Monitoring, *Projects, Reservoirs, Tennessee River, Systems analysis, Equipment, Design, Operations, Reliability, Costs, Pumping, Economics, Installation, Telemetry, Personnel, Management. Identifiers: Cost projection

With the increased pollution potential of our waters, any water quality program should include continuous monitoring as a means of evaluating the environmental conditions of a water body. Such a procedure accurately measures and records chosen parameters at specified time intervals and location(s), primarily for achieving the objectives of pollution prevention and/or abatement. This paper reports on an investigation of the equipment, personnel, installation, and operation of a continuous water quality monitoring project at Fort Loudon Reservoir on the Tennessee River. The equipment options that were initially considered for the project are discussed in some detail in a state of the arts review. Considered also are some of the most popular system designs currently being employed today. The latter part of the study is concerned with a systems analysis of the project. Equipment design and operation are men-tioned as the key factors in determining the overall success of a monitoring system. A cost projection of the project for a three-year duration and a comparison of these costs revealed that for a suitable monitoring system yielding reliable data, the operational functions will account for a major portion of the costs incurred. (Bell-Cornell) W76-01342

ENVIRONMENTAL RECONNAISSANCE TECHNIQUES FOR CONNECTICUT RIVER BASIN WATERSHEDS, Center for the Environment and Man, Inc., Hart-

For primary bibliographic entry see Field 4D. W76-01344

EXPERIENCE WITH THE DETERMINATION OF THE BIOCHEMICAL OXYGEN DEMAND
WITH SPECIAL CONSIDERATION OF THE
MODIFIED 'VIEHL DILUTION METHOD,
(ERFAHRUNGEN MIT DER BESTIMMUNG
DES BIOCHEMISCHEN SAUERSTOFFEBE-DARFS UNTER BESONDERER BERUECKSIGHTIGUNG DER MODIFIZIER-TEN VIEHL 'SCHEN VERDUENNUNG-TEN

SMETHODE), For primary bibliographic entry see Field 5D. W76-01442

WATER POLLUTION MONITORING SYSTEM. (IN JAPANESE),

M. Matsuda, and Y. Takeda. Nippon Denki Giho, (Technical Report of Nippon Electric Co.), No 2, p 73-81, March, 1975. 6 fig, 2

Descriptors: *Monitoring, *Water pollution, *Computers, Analytical techniques, *Pollutant identification, Heavy metals, Biochemical oxygen demand, Rivers, Lakes, Sewerage, Chemical oxygen demand, Data collections.

A system consisting of water pollution monitoring stations where data are collected on-line, and of a

central monitoring station to which recorded cascentral monitoring station to which recorded cas-sette tapes are supplied for computer input has been developed in Japna. The stations are set up on rivers and lakes, ar sea, and at the point of plant sewerage discharge. Data obtained at the monitor-ing stations include pollutant concentrations, water temperature, flow rate, oxidation-reduction restation, and electric conductivity. Pollutate in potential, and electric conductivity. Pollutants included cadmium and Cd compounds, cyanides, organic phosphorus compounds, lead and Pb com-pounds, Cr(VI) compounds, arsenic and As compounds, CIVII compounds, arsenic and As com-pounds, mercury and Hg compounds (including al-kylmercury), suspended solids, phenols, Cu, Zn, soluble Mn, n-hexane extracts, flurides, coliform-group bacteria and BOD and COD. These were measured by standard Japanese (JIS) methods. Data were integrated at the central monitoring station by on-line, background, off-line, and backup computer operations. (Su-FIRL) W76-01443

COMPARATIVE STUDY OF POLIOVIRUS CONCENTRATION METHODS FROM WATER (ESSAIS COMPARATIVES DE METHODES DE CONCENTRATION DU POLIOVIRUS APARTIR

For primary bibliographic entry see Field 5D. W76-01444

THE MEASUREMENT OF MLSS USING IN-TEGRATED SPHERICAL TYPE TURBIDIME-TER, (IN JAPANESE), Y. Ishihara, K. Tanaka, and H. Sunahara.

Mizushori Gijutsu, (Water Purification and Liquid Wastes Treatment), Vol 16, No 7, p 659-662, July,

Descriptors: *Measurement. *Analytical techniques, *Activated sludge, *Turbidity, Suspended solids, Pollutant identification, Waste *Turbidity, water treatment.

Mixed liquor solids(MLSS), Turbidimeters.

pre-determined quantity of mixed activated sludge solution was sampled and diluted with water to a specified volume. After rapid stirring, the turbidity of the solution was measured by an integrated spherical type turbidimeter. The activated sludge in the solution was determined by a conventional method and a calibration curve was constructed. A standard solution of kaolin was used for the calibration of the turbidimeter.

Results showed that both SEP-TW model and SEP-PT model turbidimeters gave satisfactory reproducibility and sensitivity. An ultra-sound wave method and a high speed mixer were found to give a homogeneously dispersed solution of activated sludge; a constant turbidity was obtained after 30 minutes of standing. Activated sludge at concentrations of up to 10,000 ppm can be mea-sured by the turbidity method and any coloration of the sample solution with metal ions from zero to eight percent in concentration has no apparent effect on the determination. (Su-FIRL) W76-01445

PHOSPHATE DEPENDENT FLOCCULANT DOSAGE AT PHOSPHORUS ELIMINATION FROM COMMUNAL WASTE WATER (DIE PHOSPHATFRACHT-ABHAENGIGE FAELIMITTEL-DOSIERUNG PHOSPHOR-ELIMINATION AUS KOMMU-NALEM ABWASSER), For primary bibliographic entry see Field 5D. W76-01446

5B. Sources Of Pollution

HEAT DISPOSAL IN THE WATER ENVIRON-

MENT, Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.

D. R. F. Harleman. Journal of the Boston Society of Civil Engineers Section, American Society of Civil Engineers, Vol 61, No 3, p 99-123, July 1974. 11 fig, 21 ref.

Descriptors: *Heat, *Disposal, *Water, *Environment, *Water quality, Temperature, Laboratory tests, Mathematical models, Analytical techniques, Diffusion, Budyancy. Identifiers: Prediction, Buoyant jets, Field obser-

The need for continuing development techniques for predicting temperature distribu-tions due to waste heat discharges into lakes, rivers, estuaries and the oceans is discussed. rivers, estuaries and the oceans is discussed. Emphasis is on the interactive role of basic labora-tory experiments, analytical and numerical techniques and field observations. Diffusion of buoyant jets is discussed, including heated surface jets and multiple jets issuing from a submerged multiport diffuser. In the near-field analysis of sur-face jets the important problems are related to the lateral spreading caused by buoyancy. Com-parison of theoretical predictions with laboratory and field observations is given. The mechanics of multiport diffusers for heated discharges in shallow receiving waters are discussed in contrast to sewage diffusers. The important problem is the degree to which stratification can be maintained in order to minimize local reintrainment and reduction of dilution capacity. Criteria for stable and unstable flow regimes are provided. A mathematical model for temperature distribution, with or without waste heat addition, in unsteady flows under time-varying meteorological conditions is given. Predictive techniques are needed in the preparation of environmental impact statements for pre-operational site studies in order to evaluate the economic and environmental costs of alternative cooling water system. (Bell-Cornell) W76-01012

PHOSPHORUS IN THE RURAL ECOSYSTEM--RUNOFF FROM AGRICULTURAL LAND,

Wisconsin Univ., Madison. R. Powell, and J. Densmore.

In: Proceedings of Conference on Farm Animal Wastes, Nitrates and Phosphates, in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, February 1-5, 1971, p 156-166, 9 tab, 1 ref.

Descriptors: *Phosphorus, *Agricultural runoff, Water pollution sources, Soil erosion, Fertilizers, Farm wastes, Ecosystems, Runoff. Identifiers: Manure

Public concern over pollution of the environment has increased considerably. Concern about water quality is foremost because the main result is visiquanty is followed to the water, namely the growth of algae and weeds plus possible contamination of drinking water supplies. Estimates show that less than one-third of the phosphorus entering Wisconsin waters comes from agricultural land. Agricul-tural sources of phosphorus are mainly soil erosion, fertilizers and manures. Applications of these products on snow covered, sloping fields can be potential sources of phosphorus pollution. Incorporation of animal manures immediately after application conserves the nutrients and also reduces the soil erosion potential of a sloping field. Judicious placement of intensive feeding opera-tions and careful handling of fertilizers and animal wastes will help to foster public relations between agriculture and her urban neighbors. (Cameron-East Central Oklahoma State) W76-01017

THE ROLE OF THE WISCONSIN DEPART-MENT OF AGRICULTURE IN AGRICUL-TURAL POLLUTION PREVENTION AND CON-

TROL, Wisconsin Dept. of Agricultural, Madison. For primary bibliographic entry see Field 5E. W76-01018

Group 5B-Sources Of Pollution

PHOSPHORUS IN OUR ENVIRONMENT. Wisconsin Dept. of Natural Resources, Madison. J. M. Cain, and J. E. Kerrigan.

In: Proceedings of Conference on Farm Animal Wastes, Nitrates and Phosphates, in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, February 1-5, 1971, p 134-

Descriptors: *Phosphorus, *Fertilizers, Surface waters, Environment, Wisconsin, Nutrients, Water pollution sources, Soil erosion, Waste treat-Identifiers: *Manure.

Historical background, characteristics, and principal producers of phosphorus are discussed. A major concern is the increased concentration of phosphorus in surface waters. Manure and com-merical fertilizers are the major sources of plant nutrients in Wisconsin. Estimates show that 48 percent of the total phosphorus supplied to Wisconsin crops was from manure. Much of the manure was applied on frozen ground so that it contributed significant quantities of soluble phosphorus to the spring runoff. Complications to the problem of phosphorus imbalance in the environment include such factors as the broad expanses of land and water involved, the low phosphorus concentrations at which problems occur in lake waters and the abundance and low cost of phosphorus which often preclude profita-ble recovery of phosphorus. The phosphorus problem must be considered as part of a group of interrelated problems of soil erosion, nitrogen fertilization, waste treatment, water use, and land use. (Cameron-East Central Oklahoma State) W76-01019

SOIL POLLUTANTS AND THEIR EFFECTS ON

CLEAN WATER, Minnesota Univ., St. Paul. Dept. of Soil Science. For primary bibliographic entry see Field 5C. W76-01020

ENVIRONMENTAL, ECONOMIC, AND PHYSICAL CONSIDERATIONS IN LIQUID HANDLING OF DAIRY CATTLE MANURE, New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural

Economics. For primary bibliographic entry see Field 5E. W76-01023

FEEDLOT WASTE MANAGEMENT SYSTEMS, For primary bibliographic entry see Field 5E. W76-01024

AVERT RUNOFF POLLUTION, For primary bibliographic entry see Field 5D. W76-01025

EXPERIENCE WITH A SPRAY-RUNOFF SYSTEM FOR TREATING BEEF CATTLE FEEDLOT RUNOFF.

Kansas State Univ., Manhattan. Dept. of Agricultural Engineering For primary bibliographic entry see Field 5D. W76-01026

FEEDLOT POLLUTION.

Montana State Dept. of Health, Helena. Water Pollution Control Section. For primary bibliographic entry see Field 5E. W76-01027

AREA NEEDED FOR LAND DISPOSAL OF BEEF AND SWINE WASTES, Iowa State Univ., Ames, North-Central Regional

Extension Project.
For primary bibliographic entry see Field 5E.
W76-01029

SOURCES AND FATE OF 'AVAILABLE' NITROGEN IN RURAL ECOSYSTEMS, Wisconsin Univ., Madison.
D. R. Keeney, and L. M. Walsh.

In: Proceedings of Conferences on Farm Animal Wastes, Nitrates and Phosphates in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, Feb 1-5, 1971, p 22-40, 4 fig, 8

Descriptors: *Nitrogen, *Nitrates, *Runoff, *Groundwater pollution, Rural areas, Ecosystems, Crops, Soils, Nitrogen compounds, Water pollution sources, Agricultural runoff.

The most critical problem associated with nitrogen compounds in groundwater aquifers is the possi adverse health effects on humans and animals. All sources od nitrogen--precipitation, crop residues, soil organic matter, legumes, manure, and nitrogen fertilizer--are ultimately converted to the leach ble NO3-N form by soil bacteria. Nitrogen can be lost from the soils by crop removal, leaching, denitrification, and runoff. Losses of soil material and total nitrogen are directly related to amount of runoff. Practices recommended for reduction of runoff losses include use of crop residues, application of animal manure in conjunction with crops, use of minimum tillage on slopes, and fertilization to stimulate early growth of crop. The total amount of NO3-N in the soil profile can be related directly to the rate of nitrogen application and frequency of the fertilized crop in the rotation. Methods for controlling the rate of pollution of underground water are given. Also given are methods of reducing nitrogen input into water. (Cameron-East Central Oklahoma State) W76-01031

NATURE AND HISTORY OF THE NITRATE PROBLEM.

Missouri Univ., Columbia, Dept. of Veterniary Medicine and Surgery.

A. A. Case, G. Garner, G. E. Smith, and W. H. Pfander. Science and Technology Guide, University of Mis-

souri Extension Division, p 9800-9801. 1964 Descriptors: *Nitrates, *Nitrites, *Farm wastes, *Pollutants, *Water pollution, *Forages, Corn belt, Water pollution sources, Poisons, *Water pollution effects.
Identifiers: Methomoglonemia, Fuming silos,

Animal wastes.

Excessive nitrate content of forage plants and 'loaded' water supplies is being recognized in the corn belt states (Kansas, Iowa, and Missouri) as a serious problem. The major cause of these excessive nitrates seems to be animal wastes. Fuming silos are another source of nitrate poisoning. Fum-ing silos are grain storage silos which give off an often lethal gas during the filling and a week or so afterwards. This gas comes from forage that contains excessive amounts of nitrate or nitrite, but the amount doesn't have to be very high. Juice draining from fuming silos is also a dangerous toxic agent for anything exposed to it. Nitrate poisoning of human infants and of livestock is discussed. Symptoms are described. (Drewry-East Central Oklahoma State) W76-01033

SLUDGE DISPOSAL: A CASE OF LIMITED AL-TERNATIVES. For primary bibliographic entry see Field 5D. W76-01035

MANURE WASTE PONDING STUDY. California State Water Resources Control Board, For primary bibliographic entry see Field 5D. W76-01038 Sacramento

CONTROL SYSTEMS CONCRETE DAIRY CATTLE YARDS,
Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences.
C. O. Cramer, T. J. Brevik, G. H. Tenpas, and D. A. Schlough.

Presented at the 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974; Paper No. 74-4016, 23 p, 11 fig, 6 tab, 7 ref.

ra ru pl w tie si ce w oi n

Descriptors: *Runoff, *Control, *Cattle, *Dairy industry, *Waste storage, *Waste disposal, Effuents, Precipitation, Sampling, Chemical characteristics, *Agricultural runoff, Water pollution Identifiers: *Paved yards.

Two sites were chosen for study of runoff control systems for paved dairy yards. One system, at the Holwis farms, was for 200 head of milking cows plus heifers in a cold free stall farm. The other plus heifers in a cold free stall farm. The other system, at the UW Ashland Experimental farms, contained 32 cows in a stanchion barn with paved exercise yard. Both systems were very similar with the same principles of solids separation, liquid storage, and land application. Analyses were made on the detention pond effluent and the separated solids. The Holwis farm collected 45 and % of the rain on the paved and unpaved yards and roof areas for the two years of study with 2.7 and 1.7 million gallons of effluent being removed. The Ashland farm collected 84, 67, and 71% of the rain for eight months of study with 0.6 and 0.5 million gallons of effluent being removed during the two years. Metal screens proved to be better than porous rock-filled dams for solid separation. Analyses of the retention pond effluent showed considerable variation in content. The detention ponds in both systems were designed with insufficient capacity to allow effluent to be applied only when soil conditions were favorable. The runoff control systems described required considerable labor and management. (Russell-East Central Oklahoma State) W76-01039

FIELD PERFORMANCE OF SELECTED BEEF FEEDLOT WASTE HANDLING SYSTEMS. Illinois Univ., Urbana-Champaign. For primary bibliographic entry see Field 5E. W76-01040

CATTLE FEEDLOT POLLUTION STUDY, Texas Tech. Univ., Lubbocks. Dept. of Agrono-For primary bibliographic entry see Field 5E.

CHANGES WE'VE MADE IN MANURE HAN-DLING. For primary bibliographic entry see Field 5E.

WATER QUALITY OF STORM RUNOFF FROM A TEXAS BEEF FEEDLOT, Texas A and M Univ., College Station.

G. G. Wise. III. MS Thesis, August, 1972, 166 p, 34 fig, 79 tab, 28

Descriptors: *Water quality, *Storm runoff, *Texas, *Feed lots, *Cattle, Sampling, Equipment, Chemical oxygen demand, Phosphorus, Nitrogen, Potassium, Sodium, Chloride, Slope, *Storm runoff, Waste treatment, Water pollution.

One of the major sources of pollution from high density beef feedlots is storm runoff. Efforts were made to determine the variation in chemical and physical properties of storm runoff from a beef feedlot area of Texas and to correlate the water quality variations with storm characteristics and hydrologic properties of the feedlot drainage area.

1975, 3 fig, 5 tab.

The average concentrations of water quality parameters in the feedlot runoff did not change as much with variations in rainfall intensities, runoff much with variations in rainfall intensities, runoit rates, and runoff volumes as indicated by similar runoff studies. The consentrations of COD, phosphorus, and Kjeldahi nitrogen in the runoff were directly related to the total soils concentration. The concentrations of filterable solids, potassium, sodium and chloride were greater when the contact time between the surface and the runoff was increased. The higher average concentrations of total solids, COD, phosphorus, and Kjeldahl of total sound, COS, proposed and control of fil-terable solids, potassium, sodium, and chloride from one area were due to the greater slope causing an increased sediment load and decreasing the contact time between the runoff and the feedlot surface. (Russell-East Central Oklahoma State)

CONTROLLING SEDIMENT AND NUTRIENT

LOSSES FROM AGRICULTURAL LANDS, New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics. I. J. Jacobs.

Cornell Agricultural Economics Staff Paper No 72-20, September, 1972, 16 p, 2 fig, 4 tab, 20 ref.

Descriptors: *Sediment control, *Nutrients, *Agriculture, *Phosphorus, Farm wastes, Livestock, Water pollution sources, Runoff, Model studies, Costs.

Sources of potential pollutants from agricultural production are: sediment from erosion; plant nutrients; livestock manure; pesticides; waste from processing plants; and air pollution, primarily odors and dusts. Sediment and phosphorus were nitude of sediment as a pollutant, the increased emphasis on phosphorus as a likely key nutrient in miting growth of aquatic plant life, and the diffuse sources of such pollutants from agricultural runoff as compared to point sources. Surface runoff from agricultural cropland is the primary transport agent of sediment entering surface waters. Therefore, planning for the control of sediment requires knowledge of the relations between those factors that cause loss of soil and those that help reduce such losses on cropland. The methods allowed for controlling sediment and phosphorus losses are presented. The question of which control methods and at what level depends on the level of water quality desired, the unit cost coefficients of alternative methods, and the technical coefficients of the alternative methods. A summary of the cost coefficients is presented. Sediment and phosphorus coefficients were also estimated for each management system listed. (Cartmell-East Central Oklahoma State)

ABANDONED FEEDLOTS CAN POLLUTE MORE THAN ACTIVE ONES.
Crops and Soils Magazine, Vol 27, No 3, p 23,

December, 1974.

Descriptors: *Feed lots, *Nitrogen, Cattle, Livestock, Water pollution sources, Nitrates.

Lloyd N. Mielke, U. S. Department of Agriculture and University of Nebraska soil scientist, has been conducting a study of the nitrate concentrations beneath feedlots. Under abandoned feedlots, he beneath feedlots. Under abandoned feedlots, he found an average concentration of 3.2 tons of nitrates per acre in the top 30 feet of the soil. Under active feedlots, he found only 0.8 tons per acre. The makeup of the surface of the feedlot is the reason for this difference. Active feedlots have an impenetrable seal on the surface that prevents air and water from getting through. The nitrogen under this seal is kept in a relatively immobile or-ganic form. (Cameron-East Central Oklahoma State) W76-01095

ZETA POTENTIAL STUDIES OF COLLOIDAL SUSPENSIONS FROM A BEEF CATTLE FEEDLOT SURFACE, Nebraska Univ., Lincoln. Dept. of Agricultural

Engineering. I C Lorimor

MS Thesis, 1969, 59 p, 12 fig, 12 tab, 29 ref.

Descriptors: *Zeta potential, *Feed lots, *Cattle, Runoff, Water pollution, Hydrogen ion concentration, Irrigation, Waste water treatment, Sampling, Temperature, Statistical models, Farm wastes. Identifiers: *Colloidal suspensions, Quadratic equations Alum

Runoff from beef cattle feedlots is one source of potential water pollution. Two alternatives are available to prevent feedlot runoff from polluting streams: (1) the water can be spread on agricultural land as irrigation water. or (2) it can be treated before it is released to the streams. Zeta potentials on colloidal solids in feedlot water samples were investigated as one method of treatment control. Zeta potentials average -29.5 millivolts on untreated samples. The potentials varied with pH and solids concentrations according to theory. Particle zeta potentials were controlled by chemical treatments and high chemical dosages were required to reduce the zeta potentials to near the isoelectric point. Quadratic equations could be written to accurately define the relationships between zeta potentials, solids concentrations, and pH and between zeta potentials, chemical dosages, and solids concentrations. (Russell-East Central Oklahoma State) W76-01096

OXIDATION OF CINNABAR BY FE (III) IN

ACID MINE WATERS, Stanford Univ., Calif. Dept. of Civil Engineering. For primary bibliographic entry see Field 2K. W76-01099

EVIDENCE FOR THE OCCURRENCE OF SPECIFIC IRON (III)-BINDING COMPOUNDS IN NEAR-SHORE MARINE ECOSYSTEMS,

Texas Univ., Port Aransas. Marine Science Inst. M. Estep, J. E. Armstrong, and C. Van Baalen. Applied Microbiology, Vol 30, No 2, p 186-188, August 1975, 1 tab. 10 ref.

Descriptors: "Heavy metals, "Iron, "Absorption, "Marine algae, "Marine plants, "Bioassay, Aquatic bacteria, Cultures, Ecosystems, Chromatography, Chalation, Biota, Algae. Identifiers: *Blue-green algal mat, *Sea grass, *Siderachromes, *Secondary hydroxamic acids, *Arthrobacter JG-9, Iron binding compounds.

The siderochrome auxotroph JG-9 was used in a bioassay to determine the amount of secondary hydroxamic acids (specific iron chelators) present in aqueous extracts of near-shore marine samples. The samples included blue-green algae mats and sea grass, which gave strongly positive responses. The samples were homogenized or minced in distilled water and filtered. The filtrate was concentrated and applied to filter paper discs which were applied directly to seeded JG-9 plates. The places were incubated and growth measured by diameter of zone as compared to growth of cultures on plates with known Desferal (methane sulfonate of iron-free ferrioxamine B) standards. Results indicate significant amounts of iron-binding compounds present in blue-green algal and sea grass samples. The hydroxamate type of iron chelator present may be important in providing a form of iron in sea water readily utilized by the microalgae and marine higher plants. (Davis-Vanderbilt) W76-01101

ROLE OF BACTERIA IN BIOACCUMULATION OF MERCURY IN THE OYSTER CRASSOSTREA VIRGINICA,
Maryland Univ., College Park. Dept. of

Microbiology.
G. S. Sayler, J. D. Nelson, Jr., and R. R. Colwell.
Applied Microbiology, Vol 30, No 1, p 91-96, July

Descriptors: *Mercury, *Pseudomonas, *Oysters, *Food chains, *Tracers, *Heavy *Chesapeake Bay, Absorption, Bacteria *Heavy Identifiers: Gamma counting, Bioaccumulation.

The role of mercury-resistant bacteria in the uptake of mercury by oysters was investigated. Oysters were maintained in a closed system, sealed aquarium with stirred, aerated water containing 10 micrograms of 203 HgCl2 per liter. Uptake of 203 Hg by oysters held under control con ditions was compared with that of 203 Hg uptake by oysters under similar conditions except mercury-accumulating and mercury-metabolizing aspects of Pseudomons isolated from Chesapeake Bay, were added to the experimental oysters. Mercury concentrations were determined by measuring tissue and fluid radioactivity in a spectrophotometer equipped with an an auto-gamma spectrometer. Mercury accumulation was significantly greater in oysters in the presence of the experimental bacteria. The concentration of mercury was greater in the gill and visceral tissue than other oyster tissues. (Davis-Vanderbilt) W76-01102

FATE OF TRACE METALS IN LOS ANGELES COUNTY WASTEWATER DISCHARGE,

Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics; and Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. F. M. M. Morel, J. C. Westall, C. R. O'Melia, and J. J. Morgan.

Environmental Science and Technology, Vol 9, No 8, p 756-761, August, 1975. 4 fig, 3 tab, 14 ref.

Descriptors: *Heavy metals, *Trace elements. *Pollutant *Pollutants, identification, *Poliutants, "Poliutant identification, *Equilibrium, Chemical precipitation, Waste water disposal, Water pollution, Water quality, Sewage effluents, Analytical techniques, Model studies, Solubility.

Identifiers: *Los Angeles County, *Chemical speciation, *Sewage particulate, *Sewage dilution, *Equilibrium models, Ocean outfalls.

An equilibrium model is presented of trace metal movement from an ocean outfall. The chemical speciation of trace metals as they reach the ocean from the Los Angeles sewage system is discussed. A study of the oxidation and dilution of the sewage by seawater demonstrates that most metals tend to be solubilized upon disposal in the ocean and that unmeasurable increments in the natural metal concentrations should result in the farfield. It is hypothesized that the sewage particulate is not mobilized in the vicinity of the outfall and that the nearby sediments are a mixture of naturally occurring sediments and sewage particulate. About 0.5% of the sewage particulate (and its metal content) can be accounted for in the reduced area on the ocean floor around the county outfall system. The study points out important research needs in the area of analytical chemistry of wastewaters and in the area of physical transportation processes in coastal waters. (Davis-Vanderbilt) W76-01104

NUTRIENT AND SEDIMENT DISCHARGE FROM AGRICULTURAL WATERSHEDS IN OKLAHOMA,
Agricultural Research Service, Durant, Okla.

Water Quality Management, Lab. For primary bibliographic entry see Field 2A. W76-01116

Group 5B-Sources Of Pollution

PHOSPHORUS IN SURFACE RUNOFF FROM A PHOSPHORUS IN SURFACE RUNOFF FROM A DECIDUOUS FOREST,
Minnesota Univ., St. Paul. Dept. of Soil Science.
M. J. Singer, and R. H. Rust.
Journal of Environmental Quality, Vol 4, No 3, p 307-311, 1975. 4 fig, 2 tab, 26 ref.

Descriptors: *Phosphorus, *Rainfall-runoff relationships, *Eutrophication, *Surface runoff, *Deciduous forests, Minnesota, Snowmelt, Forest soils. Soil erosion.

Identifiers: Lake Minnetonka(Minn).

Phosphorus loss in surface runoff from a deciduous forest ecosystem was determined in Lake Minnetonka, Minnesota, watershed. Runoff was highest in March due to melting snowpack, in May due to continuous heavy rains, and in July due to intense short duration rains on dry soil. Runoff in other months was related to rainfall amount, intensity, and soil moisture. Most small storms did not precipitate runoff. Intense storms often exceeded the soil's infiltration rate, dislodged soil particles, with consequent runoff. The canopy reduced precipitation intensity and amounts reaching soil surface. Forest litter had a large water holding capacity and rapid infiltration rate which protected soil mineral from direct rainfall impact and reduced runoff. Any melting snow in December-January saturated lower snow layers but did not create runoff. Spring runoff volume was deter-mined by snowpack depth, water content, air tem-perature, and presence or absence of frozen soil surfaces. Yearly runoff volume and timing varied greatly. March runoff had more phosphorus but in other months phosphorus concentration was inrelated to runoff volume. Sediment phosphorus loss was linearly correlated with maximum precipitation. Care should be given in extrapolating the findings for the rate of phosphorus loss from the test plot to an entire forest.
(Buchanan-Davidson--Wisconsin) W76-01145

NITRATE, PHOSPHORUS, AND SULFATE IN SUBSURFACE DRAINAGE WATER, Iowa State Univ., Ames. Dept. of Agricultural En-

gineering. J. L. Baker, K. L. Campbell, H. P. Johnson, and J.

J. Hanway. Journal of Environmental Quality, Vol 4, No 3, p 406-412, 1975. 2 fig, 4 tab, 17 ref.

Descriptors: *Eutrophication, Groundwater, *Nutrients, Nitrates, Nitrogen, Sulfates, Phosphorus, Phosphates, Subsurface drainage, Fertilization, Flow rates, Agriculture,

Identifiers: Skunk River(Iowa).

To determine nutrient losses associated with subsurface drainage water and the effect fertilization rate has on these losses, measurements were made of flow, nitrate-nitrogen, phosphate-phosphorus, total phosphorus, and sulfate-sulfur in subsurface drainage water from tile-drained cropland in Iowa. Annual nutrient losses were variable; phosphorus, sulfate-sulfur, and nitrate-nitrogen losses ranged from 0 to 0.04, 0 to 32, and 0 to 93 kg/ha, respectively, and were dependent on amount of water lost. Because of low phosphorus concentrations, losses with subsurface drainage water were insignificant compared to losses associated with surface runoff. Sulfate-sulfur and nitrate-nitrogen concentrations appeared to be inversely related. Tile drainage water with consistently high nitratenitrogen relative to surface runoff was believed responsible for high nitrate-nitrogen contents sometimes found in rivers draining central Iowa. Nitrate from saturated and unsaturated soil indicated that water waves or pulses with different nitrate-nitrogen concentrations move through the soil causing variations in subsurface drainage water with time and flow rate. The large amounts of nitrate-nitrogen lost from some tile drains with modest fertilization and variations in tile drains make it impossible to ascribe nitrate-nitrogen loss

fertilizers alone. Nitrate-nitrogen loss represents an economic and energy waste as well as an environmental hazard. (Buchanan-Davidson-Wisconsin) W76-01146

WATER POLLUTION FROM AGRICULTURE, Kungliga Lantbrukshogskolan, Uppsala (Sweden).

Journal Water Pollution Control Federation, Vol 47, No 4, p 789-795, 1975. 3 fig. 9 tab, 1 ref.

Descriptors: *Agricultural runoff, *Water pollu-Descriptors: "Agricultural runoft, "water pollu-tion, Fertilizers, Farm wastes, Groundwater, Urine, Livestock, Nitrogen, Phosphorus, Nitrates, Nutrients, Water pollution sources, Eu-rope, Feeds, Feed lots, Sludge, Silage. Identifiers: Sweden.

Risks of surface and groundwater pollution in Sweden are increasing due to increased livestock production and use of commercial fertilizers in agriculture. Urine and silage juice are especially rich in organic contaminants. Wastewater from dwellings in usually treated in septic tanks before release into open water or infiltration into the ground. To prevent water pollution, manure and silage juice should be spread on arable land. The application of sewage sludge as a fertilizer should not exceed 150 tons/ha in wet form and be spread at widely spaced intervals. Urine, dungyard water, liquid manure, and silage juice may leak into surface and groundwater from animal stables. Commercial fertilizer use has increased thus climatic and soil factors are crop growth limiting. Nitrogen is mostly in the form of nitrates, with very small amounts of ammonia. Phosphorus is sometimes very high in groundwater. Chemical reduction probably a role in deeper layers, especially in clay soils. The nitrogen budget for a field at Nasbygard, Sweden is given; most of the input went to grain, some to air and water. Neither burning of straw nor excessive fertilizer is acceptable husbandry. (Buchanan-Davidson--Wisconsin) W76-01162

PHOSPHORUS IN NEW YORK STATE RIVERS: SOURCES, SINKS, AND DETERGENTS, State Univ. of New York at Binghamton. Dept. of

Chemistry.

Available from the National Technical Informa tion Service, Springfield, Va 22161 as PB-236 93, \$4.50 in paper copy, \$2.25 in microfiche. Report SS-306 (NSF-RA-G-73-032), August 1973. 58 p. 8 fig, 9 tab, 39 ref.

Descriptors: *Eutrophication, *Phosphorus, *Rivers, *Detergents, *Water pollution sources, *New York, Sinks, Input-output analysis, Runoff, Land use, Absorption, Watersheds(Basins), Sediments, Sewage effluents, Model studies, Land management.

Identifiers: Mass balances, Susquehanna River(NY), Genessee River watershed(NY), Al-legheny River watershed(NY), Mohawk River watershed(NY).

Phosphorus levels in New York rivers considerably exceeded the phosphorus concentrations in lakes. Municipal wastewaters were especially important, but removal of phosphorus from detergents should substantially reduce phosphorus inputs. Mass balances (inputs versus outflow for a one year period), using phosphorus runoff factors, according to land use and per capita sewage for phosphorus in seven New York watersheds, including basins of the Susquehanna, Genesee, Allegheny, and Mohawk Rivers, showed qualitative agreement. Data on sewage discharges, sediment characteristics, and river phosphorus uptake for the Susquehanna River were collected and a model of phosphorus load versus river miles constructed: this agreed with measured phosphorus loads. Phosphorus reduction in municipal wastewaters due to a ban on phosphate detergents and better land management practices will help. An integrated approach to waste disposal is needed so that nutrient removal from effluents can be coor-dinated with river models and biological impacts, to determine the size and location of dischar order to minimize their effects. (Buchanan-Davidson--Wisconsin) W76-01170

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS. Geological Survey, Reston, Va. For primary bibliographic entry see Field 2K.

GEOHYDROLOGY AND WATER QUALITY OF THE MISSISSIPPI RIVER ALLUVIAL AQUIFER, NORTHEASTERN LOUISIANA, Geological Survey, Baton Rouge, La. For primary bibliographic entry see Field 2F. W76-01180

BENTHIC FAUNA AND ZOOPLANKTON IN SOME POLLUTED SWEDISH ESTUARIES. Uppsala Univ. (Sweden). Inst. of Zoology.
I. Olsson, R. Rosenberg, and E. Olundh.
Ambio, Vol 2, No 5, p 158-163. 1973. Illus.
Identifiers: *Benthic fauna, Corer, Diversity,
Gradients, Outflows, Plankton, *Estuaries, Gradients, Outflows, P. Rivers, *Salinity, *Zooplankton, *Sweden.

Meiofauna (0.1-1 mm), macrofauna (>1 mm) and zooplankton (> 0.16 mm) in 4 Swedish estuaries were sampled with piston corer, Smith-McIntyre grab and Nansen net, respectively. The faunal communities were evaluated by indicies. The diversity of the meiofauna reflected differences in oliversity of the meiotauna reflected differences in pollution rather than differences in salinity. Acombined effect of pollution and reduced salinity gave a lower macrofaunal diversity outside river mouths. The meio- and macrofaunal composition was often similar between the various estuaries than within individual estuaries, reflecting the steep gradient caused by river outflow with ef-fluents. The zooplankton fauna was almost uniform in all the estuaries .-- Copyright 1974, Biological Abstracts, Inc. W76-01194

MATHEMATICAL MODELLING AQUATIC ECOSYSTEM: I, Wright State Univ., Dayton, Ohio. N. N. Gupta, and J. Houdeshell.

Int J Syst Sci. Vol 4, No 5, p 765-770. 1973. Illus. Identifiers: Aquatic systems, *Ecosystem, *Mathematical models, Nutrients, Phytoplankton, Zooplankton, *Model studies, Biodegradation.

A mathematical model of an aquatic ecosystem is presented. The model differs from previous models in that it incorporates characteristics of specific phyla of phytoplankton and zooplankton, inter- and intra-phyla interaction and limiting nutrient processing by decomposers.—Copyright 1974, Biological Abstracts, Inc.

INDUSTRY WASTE STUDY. THE HAWAII SUGAR INDUSTRY WASTE STUDY.

Environmental Protection Agency, San Francisco.

Calif. Region IX.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 931, \$5.50 in paper copy, \$2.25 in microfiche. June, 1971. 115 p, 34 fig, 18 ref, 9 tab.

Descriptors: *Hawaii, *Industrial wastes, *Sugarcane, *Water pollution, Water pollution sources, Wastes, Surface runoff, Water quality control, Bacteria, Coliforms, Suspended solids, Chemical oxygen demand, Nitrogen, Phosphorus,

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

Waste water, Water quality standards, Irrigation water, Storm runoff, Nutrients, Water pollution control, Sea water.

Identifiers: *Sugar industry, Sugar refining, Bagasse.

Wastes generated by agricultural activities in Hawaii, particularly sugar mill operations, are creating significant water pollution problems which threaten the tourist industry. A preliminary industrial process survey was made of all 26 sugar mills located in the State of Hawaii, and detailed in-plant surveys were carried out in 3 mills. The results show that sugar mill waste water (mill processing water and cane-wash water) as well as irrigation water and storm water runoff from fields contain large amounts of oxygen-consuming materials, suspended solids, nutrients, and bacteria. Average sugar production at each of the 3 mills was 210 tons/day and effluent flow rates were between 5 and 10 million gal/day. The mill water contained, per ton of raw sugar produced, an average of 1,850 lb of suspended solids, 1750 lb of settleable solids, 650 lb of oxygen-consuming material (as measured by COD), 12 lb of total nitrogen, and 5 lb of phosphorus. The bacterial densities found in the wash waters average 4,850,000 total coliform organisms/100 ml. At least 8 of the mills on the island of Hawaii and 2 mills on the island of Kauai discharge cane trash and/or bagasse to the ocan. To enhance water quality to the level described in the Water Quality Standards of the State of Hawaii in those areas influenced by discharges from sugar plantations, the following changes in operating conditions should be made: the discharge of trash and bagasse to coastal waters should be discontinued; all discharges should be treated or controlled; and efforts should be made to control excess irrigation and storm runoff waters. (Witt-IPC)

BASICS OF POLLUTION CONTROL. Gurnham and Associates, Inc., Chicago, Ill. For primary bibliographic entry see Field 5D. W76-01228

LIMITED ARSENIC DISPERSION IN SEA WATER, SEDIMENTS, AND BIOTA NEAR A CONTINUOUS SOURCE, Fisheries and Marine Services, St. John's

Fisheries and Marine Services, St. John' (Newfoundland). Biological Station. For primary bibliographic entry see Field 5C. W76-01262

DOMESTIC SOURCES OF STREAM PHOSPHATES IN URBAN STREAMS, Windsor Univ., (Ontario). Dept. of Geography. P. D. La Valle. Water Research, Vol 9, No 10, p 913-915, October 1975, 3 tab. 12 ref.

Descriptors: *Regression analysis, *Phosphates, *Water pollution sources, Fertilizers, Detergents, Domestic wastes, Water pollution, Urbanization, Sampling, Analysis, Chemical analysis, Water analysis, Rainfall, Septic tanks, Sewers, Census, On-site investigations, On-site data collections. Identifiers: *Windsor(Canada), *Urban streams, Residential areas.

To assess the relationships between stream orthophosphate, stream polyphosphate concentrations, and possible domestic sources, a random sample of 24 drainage basins dominated by residential land use activities was studied. Stream orthophosphate and polyphosphate data were then correlated with the following variables: (1) mean garden fertilizer use (kg/yr), (2) mean phosphate detergent used (kg/month), (3) per cent watershed households connected to city sewers, (4) precipitation phosphate concentration. When a multiple regression analysis was run on the phosphate data, 76% of the variation in stream orthophosphate

concentrations was accounted for by the percentage of watershed households connected to city sewers parameter, while garden fertilizer use and precipitation phosphate content accounted for 4 to 2% of the variation respectively. In a similar analysis of stream polyphosphate concentrations, a combination of detergent use and the percentage of watershed households connected to city sewers accounted for 48% of the total variation of stream polyphosphate concentrations. (Lardner-ISWS) W76-01263

ASSESSING UNRECORDED ORGANIC POLLU-TION FROM AGRICULTURAL, URBAN, AND WOODED LANDS,

Rutgers--The State Univ., New Brunswick, N.J. S. L. Yu, W. Whipple, Jr., and J. V. Hunter. Water Research, Vol 9, No 10, p 849-852, October 1975. 5 fig, 4 tab, 9 ref.

Descriptors: *Biochemical oxygen demand, *Water pollution, *Organic wastes, *Water pollution sources, *Regression analysis, *New Jersey, Streamflow, Frequency analysis, Watersheds(Basins), Runoff, Sampling, Analysis. Identifiers: Wooded areas, Agricultural areas, Urban areas.

An investigation was conducted of the organic pollution for seven small New Jersey watersheds representing agricultural, urban, and wooded lands. The 5-day biochemical oxygen demand (BOD) was used as a main index of organic pollution. Data obtained for 2.5 yr period indicated background BOD concentrations averaging from 0.5 to 2.0 mg/l in all streams, except that a value of 9.0 mg/l was obtained for a residential-commercial-industrial area. During or after rainstorms, the BOD loadings, in pounds per day per unit area, usually became more than ten times the background amount for all streams. No significant correlation was found between BOD concentration and flow rate, but good correlations were obtained between BOD loadings and flows. The seasonal pattern of BOD loading distribution was examined. The frequency distribution of BOD concentrations and loadings were also obtained. (Lardner-ISWS)

LIMITATIONS OF THE ELECTRICAL RE-SISTIVITY METHOD IN LANDFILL IN-VESTIGATIONS, G. Klefstad, L. V. A. Sendlein, and R. C.

G. Klefstad, L. V. A. Sendlein, and R. C. Palmquist.

Ground Water, Vol 13, No 5, p 418-427, September-October 1975. 10 fig, 1 tab, 23 ref.

Descriptors: *Resistivity, *Landfills, *Water pollution, *Leachate, *Geologic investigations, *Iowa, *Pollutant identification, Physical properties, Electrical resistance, Solid wastes, Pollutants, On-site investigations, On-site data collections, Exploration, Water quality.

thous, Exploitation, Water quanty.

*Leachate detection, *Electrical resistivity method, Isoresistivity maps, Isoconcentration maps.

The electrical resistivity method was used to delineate shallow zones of groundwater contamination resulting from solid waste disposal sites. Application of this method to sites located in alluvial deposits in Iowa revealed that the degree of success of the method was directly related to the degree of contamination. A detailed investigation of the interrelationship between electrical resistivity, material variation, and water quality was conducted in the alluvial deposits of the Skunk River at Ames, Iowa. The lateral variation of materials at this site resulted in a large, natural scatter in the resistivity response. The decrease in resistivity due to contamination was not greater than this natural scatter and thus could not be detected. These results suggested a relationship between the scatter levels at any site and the

minimum degree of contamination necessary to be detected. The minimum level of contamination which can be detected over the natural scatter was called the threshold value. The threshold value must be known before the resistivity method can be applied with confidence. (Sanderson-ISWS) W76-01268

HYDROGEOLOGIC EVALUATION OF SOLID WASTE DISPOSAL IN SOUTH CENTRAL WISCONSIN,

Wisconsin Dept. of Natural Resources, Madison. For primary bibliographic entry see Field 5G. W76-01273

THE IMPORTANCE OF ACCURATE CURVE NUMBERS IN THE ESTIMATION OF STORM RUNOFF, Utah State Univ., Logan, Watershed Science Unit.

Utah State Univ., Logan. Watershed Science Unit. For primary bibliographic entry see Field 2A. W76-01305

CLASSIFYING STORM RUNOFF POTENTIAL WITH PASSIVE MICROWAVE MEASURE-MENTS

Agricultural Research Service, Chickasha, Okla. For primary bibliographic entry see Field 7B. W76-01306

URBANIZATION IMPACT ON WATER QUALITY DURING A FLOOD IN SMALL WATERSHEDS,

Wisconsin Univ., Milwaukee, Dept. of Geological Sciences.

For primary bibliographic entry see Field 4C. W76-01307

SOIL EROSION ON SELECTED HIGH CLAY SUBSIOLS, Agricultural Research Service, Oxford, Miss.

Agricultural Research Service, Oxford, Miss Sedimentation Lab. For primary bibliographic entry see Field 2J. W76-01308

COMPARISON OF WARM WATER EVAPORA-

Canterbury Univ., Christchurch (New Zealand), Dept. of Civil Engineering. For primary bibliographic entry see Field 2D. W76.01316.

THE ELIMINATION OF PHOSPHATES AND NITRATES OF WASTE WATER BY ALGAE CULTURES: I (/N FLEMISH),

Ghent Rijksuniversiteit (Belgium). Laboratorium voor Anorganiche Technische Chemie, Elektrotermie en Elektrochemie.

For primary bibliographic entry see Field 5D. W76-01312

CONSTRUCTION OF A SPILL CHANNEL AND EXPERIMENTAL DETERMINATION OF SPILL SPREADING RATES OF FOUR NON-HAZARDOUS CHEMICALS ON WATER. Lowell Technological Inst., Mass. Dept. of Mechanical Engineering. For primary bibliographic entry see Field 8B.

For primary bibliographic entry see Field 8B W76-01320

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS, FEBRUARY 1973

1973, Canada Centre for Remote Sensing, Ottawa (Ontario). Data Acquisition Div. For primary bibliographic entry see Field 5A. W75.01326

Group 5B-Sources Of Pollution

A SURVEY FOR THE USE OF REMOTE SENSING IN THE CHEMICAL BAY REGION, Maryland Univ., Solomons. Chesapeak Biological Lab

R. E. Ulanowicz.

Available from the National Technical Information Service, Springfield, Va 22161 as N75-10571, \$5.00 in paper copy, \$2.25 in microfiche. Chesapeake Research Consortium Publication No 6, June 1974. 89 p.

Descriptors: *Remote sensing, *Chesapeake Bay, *Bays, *Estuaries, Nutrients, Thermal pollution, Industrial wastes, Pesticides, Industrial plants, Erosion, Wetlands, Land use, Meteorology, Solid wastes, Satellites(Artificial), Radar. Identifiers: Data collection platforms

Twelve environmental problem areas concerning the Chesapeake Bay region were reviewed along with ongoing remote sensing programs pertaining to these problems. Forty-three recommendations were presented to help fill lacunae in present research and to utilize the remote capabilities of NASA to their fullest. A list of interested or-ganizations and individuals was presented for each category. Among the recommendations were the development of technologies to monitor dissolved nutrients in Bay waters, the initiation of a census of the disappearing rooted aquatic plants in the littoral zones, and the mapping of natural building constraints in the growth regions of the states of Maryland and Virginia. (Sims-ISWS) W76-01327

STOCHASTIC ANALYSIS AND CONTROL OF ESTUARINE SYSTEMS: VOL I--ESTIMATION AND PREDIC-TION.

New York City, Rand Inst. N.Y. For primary bibliographic entry see Field 5G. W76-01340

A SYSTEMS ANALYSIS OF A CONTINUOUS WATER QUALITY MONITORING PROJECT, Tennessee Univ., Knoxville. Water Resources

Research Center For primary bibliographic entry see Field 5A. W76-01342

ANIMAL WASTES AND FERTILIZERS AS POTENTIAL SOURCES OF NITRATE POLLUTION OF WATER,

Agricultural Research Service, Fort Collins, Colo F. G. Viets, Jr.

In: Effects of Agricultural Production on Nitrates in Food and Water with Particular Reference to Isotope Studies, Vienna, International Atomic Energy Agency, p 63-76, 1974. 1 tab, 32 ref.

Descriptors: *Farm wastes, *Water pollution, *Nitrates, *Fertilizers, Hydrology, Nitrification, Infiltration, Eutrophication, Agricultural runoff, Ammonia, Volitalization. Identifiers: Isotopic nitrogen

An updating and supplementing of the U.S. Department of Agricultural Handbook 413, 'Factors Affecting the Accumulation of Nitrate in Soil, Water, and Plants' (Viets and Hageman, 1971) are provided. A change from vegetable protein to animal protein in the human diet has resulted in the increased use of nitrogen fertilizer in the developed countries for the last 30 years. Stocking rate and the continuity of use of the feed-yard or holding area appear to be the factors upon which initiate percolation to aquifers depend. Because of inhibited nitrification and infiltration, modern high-density cattle feed-yards have low nitrate flux. Volatilization of ammonia and its absorption by surface water may contribute to eutrophication and nitrate accumulation. Nitrate leakage occurs under highly productive cultivated land regardless of the nitrogen source. Fertilization management must hold this leakage to a tolerable concentration in relation to hydrology and use of underground water in the area. There is a need for better understanding of land productivity, nitrate leakage, and hydrology. Assistance in solving these problems may be obtained from isotopic nitrogen. (Kehl-East Central Oklahoma State)

THE NITROGEN STATUS BENEATH BEEF CATTLE FEEDLOTS IN EASTERN NEBRASKA, Department of Agriculture Lincoln, Nebr. J. R. Ellis, L. N. Mielke, and G. E. Schuman Soil Science Society Proceedings of America, Vol 39. No 1, p 107-111, January-February, 1975, 4 fig.

Descriptors: *Farm wastes, *Feed lots, *Nitrogen, *Soil profile, *Nebraska, Cattle, Soil contamina-tion, Groundwater, Water pollution sources, *Path

The majority of the beef consumed in the United States comes from cattle fed in large, open, soilsurfaced feedlots in the Plains States and the Midwest. Feedlots are point sources of nitrogen since they provide intensive land use. The effects of beef-feedlot management systems on N accumulation in the soil profile and ground water were examined. Fifteen sites were selected in eastern Nebraska. Core samples were taken from feedlots, cropland-cattle-use areas and from cropland adjacent to feedlots to evaluate the effects of different management practices on the movement and accumulation of nitrogen in the soil profile. The soil texture of the feedlots sampled ranged from clay to coarse sand with the age of the feedlots ranging from a few weeks to more than 50 years. The sites examined were ranked according to decreasing average NO3 -N in the core as fol lows: abandoned feedlot, feedlot-cropland, upland feedlot, corn (Zea mays L) river-valley feedlot, profiles under feedlot mounds, alfalfa (Medicago sativa L) grassland. Feedlot management is an important consideration in the accumulation of NO3 in the soil profile. (Kehl-East Central Oklahoma State) W76-01381

LOCATING A NEW FEEDLOT,

Nebraska Univ., Lincoln.

E. A. Olson.

Cooperative Extension Service Report GPE-5/01, University of Nebraska, Lincoln, n.d. 4 p, 5 fig.

Descriptors: *Feed lots, *Locating, *Farm wastes, *Water pollution, Livestock, Regulation, Zoning, Topography, Water supply, Transportation, Marketing.

The selection of a site for a livestock feedlot directly affects the success of the feedlot. Factors to consider in choosing a feedlot location include: environmental considerations, streams, topography, water supply, land area, towns and zoning laws. Other items include a source of livestock and feed, transportation (roads) and marketing facilities. Finally the operator must determine the size to build with provision for expansion. (Cartmell-East Central Oklahoma State) W76-01383

DISPOSAL OF FARM ANIMAL WASTES THROUGH THE SOIL,

Oregon State Univ., Corvallis.
M. G. Cropsey, and V. Van Volk.
Agricultural Engineering Annual Report of Research 1971-72, Agricultural Experiment Station, Oregon State University, Corvallis, 1972, 24 p. 1 fig, 14 tab.

Descriptors: *Waste disposal, *Cattle, *Dairy industry, *Irrigation, Slurries, Chemical properties, Water quality, Water pollution sources.
Identifiers: *Land disposal, *Waste water quality.

Disposal of livestock manure through an irrigation pumping system has proven economically successful, but some questions still need to be answered. The objective of this study was to determine the effect of large and frequent applications of dairy cow wastes on the soil. Another objective was to determine the quality of waste water in the soil and in the drainage water from such soil sites. The Oregon State University Dairy Farm was used for the study. It was determined that dairy manure slurry should not be applied the first year or two to soil plot that has recently been installed with drain tile. This is advised because the slurry will drain tile. This is advised because the sairly win short circuit through the freshly dug soil to the drain tile. When compared with the effluent ap-plied there was a considerable reduction in TS, BOD and all forms of phosphorus and nitrogen in the dry wells and the drain tile. A considerable portion of both the liquids and solids was retained either in the soil or on the surface. The wind has considerable influence over the distribution of the manure water slurry. Recommendations for further investigation and some advice on application are given. (Kehl-East Central Oklahoma W76-01384

CURRENT LIVESTOCK POLLUTION REGU-LATIONS.

For primary bibliographic entry see Field 5G. W76-01385

TRANSFORMATIONS OF SWINE WASTE-WATER IN LABORATORY SOIL PROFILES, North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.

L. F. McEver, F. J. Humenik, M. R. Overcash, and R. W. Skaggs

and K. W. Skaggs.
Presented at 1974 Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, Paper No 74-2016, American Society of Agricultural Engineers, St. Joseph, Michigan. 19 p. 8 fig, 5 tab, 9 ref.

Descriptors: *Soil profiles, *Laboratory tests, Percolation, Nitrogen, Nitrates, Chemical oxygen demand, Water table, Liquid wastes, Hogs, Path of pollutants, *Waste water(Pollution). Identifiers: *Loading rates.

The major objective was to investigate the transformations of swine waste lagoon effluent in packed and undistrubed Wagram soil columns with a shallow water table (36 inches). 70 percent of the wastewater nitrogen was converted to nitrate within the rooting zone (upper six inches) for loading rates of one and two inches per week with COD values ranging from 199 to 650 mg/1. While the organic materials moved through the soil with the soil water, a reduction in concentration with increased depth was observed. The organic portion of the swine wastewater was essentially stabilized after one week of storage in the upper stabilized after one week of storage in the upper soil regions. Almost complete removal (greater than 90 percent) of COD and TOC was recorded for flow through the entire packed and undisturbed soil columns. Mass balances showed no losses in total nitrogen as the wastewater perco-lated through the soil columns. The low COD to nitrogen ratio of the pretreated wastewater and the preferential removal of organics with soil depth restricted the possibility of induced percolation of carbonaceous substrate to the water table for complete denitrification without supplemental organic addition. (Cartmell-East Central Oklahoma State) W76-01387

COMPARISON OF SOME CALCULATION METHODS FOR RAINWATER RUNOFF METHODS FOR (VERGLEICH EI BERECHNUNG EINIGER SMETHODEN VON REGENWASSER-KANALISATIONEN), For primary bibliographic entry see Field 2A. W76-01426

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5 Effects Of Pollution-Group 5C

THE QUALITY AND TREATMENT OF ARTE-SIAN WATERS IN HUNGARY (A HAZAI MELYSEGI VIZEK KEZELESENEK SZUK-SEGESSEGE ES TECHNOLOGIAJA), For primary bibliographic entry see Field 5F. W76-01453

STUDIES ON THE ACTIVITY OF A SODIUM HYPOCHLORITE SOLUTION ON VIBRIO CHOLERAE BIOTYPE ET TOR FOR DRINKING WATER STERILIZATION, Dakar Univ. (Senegal). Faculty of Medicine and

For primary bibliographic entry see Field 5D. W76-01465

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UPTAKE AND MIGRATION OF TRACERS IN LAKE SEDIMENTS, Northwestern Univ., Evanston, Ill. Dept. of

Geological Sciences. For primary bibliographic entry see Field 2H. W76-01479

A SIMPLE DIFFUSION MODEL OF THE MEAN FIELD DISTRIBUTION OF SOLUBLE MATERIALS IN THE GREAT LAKES,
Canada Centre for Inland Waters, Burlington,

(Ontario)

F. M. Boyce, and P. F. Hamblin. Limnology and Oceanography, Vol 20, No 4, p 511-517, July 1975. 3 fig, 1 tab, 6 ref.

Descriptors: *Diffusion, *Mathematical models, *Lake Erie, *Mixing, Great Lakes, Tracers, Flow, Advection, Chlorides, Distribution patterns, Pollutants, Water pollution, Path of pollutants,

Identifiers: *Chloride distribution, Concentrations, Transport.

In cases where the time scale of interest is long compared with the time scales of the principle energy-bearing components of the water motions, the movement of a soluble contaminant may be represented by a simple diffusion equation with a constant effective horizontal diffusion coefficient. A simple steady state model of the concentration field in a lake for a soluble contaminant introduced on the shore was developed and was applied to the distribution of chloride ion in the central basin of Lake Erie, for which appropriate experimental data were available. A horizontal diffusion coefficient, appropriate for basin-wide diffusion phenomena in the Great Lakes and for long-time scales, was estimated from experimental data. (Adams-ISWS) W76-01476

CLASSIFICATION OF MODELS OF TIDAL

WATERS, Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering. For primary bibliographic entry see Field 2L.

MATHEMATICAL MODEL STUDIES OF WATER QUALITY IN THE POTOMAC ESTUA-

Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.

L. J. Clark, and K. D. Feigner.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-229 797, \$7.50 in paper copy, \$2.25 in microfiche. Technical Report 33, March 1972. 174 p, 70 fig, 1 tab, 10 ref,

Descriptors: *Model studies, *Water quality, *Estuaries, *Potomac River, idathematical models, Dye releases, Path of pollutants, Effluents, Tidal waters, Tidal effects, Dispersion, Advection. Identifiers: *Anacostia River.

Mathematical models are becoming an increasingly important 'tool' for predicting, under a variety of conditions, water quality behavior in an estuary. The report presented recent Annapolis Field Office studies on use of models in the Potomac estuary, specifically, the Thomann Model (time-dependent version) and the FWOA Dynamic Estuary Model. Numerous computer runs were made with both models in an attempt to make a reasonably accurate simulation of dye profiles observed in the Potomac estuary following a 13-day continuous release during November 1969 and of observed dye profiles in the Anacostia River following a 7-day continuous release during April 1970. In addition to model verification, con sideration was given to: (1) a comparison of modeling approaches, (2) the limitations of each model, (3) input data requirements, and (4) a detailed sensitivity analysis to determine which input parameters had the greatest effect on model output. While mathematical models have been developed for the entire Potomac estuary, most studies in the report pertained to the 40-mile reach of the upper estuary extending from Key Bridge to Sandy Point. (Sims-ISWS) W76-01497

WATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA - LAKE ERIE, VOLUME I - SYNTHESIS, Cleaveland Dept. of Public Utilities, Ohio. Div. of

Utilities Engineering. A. B. Garlauskas.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 353, \$6.75 in paper copy, \$2.25 in microfiche. Report EPA-905/9-74-005, May 30, 1974. 158 p, 33 fig, 22 tab, 345 ref. EPA G00517.

*Water quality, *Lake Erie, Descriptors: Baseline studies, Streams, Rivers, Lakes, Fish, Water pollution, Pollution abatement, Pollutant identification, Path of pollutants, Industrial wastes, Cities, Urban runoff, Urban drainage, Pollutants, Water pollution sources, Surveys, Water chemistry, Benthos, Investigations, San Analysis, Thermal pollution, Model studies. Identifiers: *Cleaveland(Ohio).

The results of the first phase of a three-phase program in environmental impact assessment, planning, and evaluation in urban water pollution abatement for the Cleveland metropolitan area were presented. The first phase investigated the water quality of near shore waters of Lake Erie in the Cleveland area and of the streams in the same area to establish a baseline to measure the prograss and restorative value of water pollution abatement programs. Seven major investigations were performed dealing with fish population, phytoplankton, zooplankton and benthic organ-isms, benthic sediment chemistry, water chemistry, cation reactions with suspended river sediments, and hydrodynamic modeling of river and thermal discharge flow into Lake Erie. The field investigations were conducted from September 1971 through December 1972. The area of investigation included lake waters from the mouth of Chagrin River along the shore to the mouth of the Rocky River, 35.5 kilometers. The area included the Cleveland Harbor and lower 20 kilometers of the Cuvahoga River. The study established a rough water quality baseline demonstrating areas of water quality degradation, possible restoration avenues, and need for future research. (Sims-W76-01500

5C. Effects Of Pollution

THE PRAIRIE PLAN, Metropolitan Sanitary District of Creater Chicago, III

Journal of the Urban Planning and Development Division, American Society of Civil Engineers, Vol 99, No UP2, p 205-215, September 1973. 14

Descriptors: *Water reuse; *Environmental effects, *Sewage disposal, *Sludge disposal, *Sludge, *Agriculture, Waste water(Pollution), Reclamation, Planning, Watersheds(Basins), Identifiers: *Urban planning, *Chicago, Urban

The Prairie Plan is a conceptual mechanism to recycle urban wastes safely into the natural en-vironment. It assumes that to provide an accepta-ble solution, the following four requirements must be met: (1) the solution to the problem must be environmentally safe and not transfer the problem to another form of pollution; (2) the solution must be long-term and provide consistently reliable methods of operation; (3) the system must be economically competitive with other alternatives; and (4) the system must maximize multi-use aspects and be both publicly and politically acceptable. The Prairie Plan uses the natural watershed as a planning unit. The Metropolitan Sanitary District of Greater Chicago is implementing the Prairie Plan to recycle wastewater solids over at a 10,500-acre site in Fulton County, Il-linois. The multi-use benefits od the Prairie Plan include land reclamation, agriculture, recreation, conservation, wildlife preservation, reforestation, and natural science education. (Bell-Cornell) W76-01011

PHOSPHORUS IN THE RURAL ECOSYSTEM-RUNOFF FROM AGRICULTURAL LAND, Wisconsin Univ., Madison. For primary bibliographic entry see Field 5B.

W76-01017

PHOSPHORUS IN OUR ENVIRONMENT, Wisconsin Dept. of Natural Resources, Madison. For primary bibliographic entry see Field 5B. W76-01019

SOIL POLLUTANTS AND THEIR EFFECTS ON CLEAN WATER,

Minnesota Univ., St. Paul. Dept. of Soil Science. W. P. Martin.

In: Proceedings of Conference on Farm Animal Wastes, Nitrates and Phosphates, in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, February 1-5, 1971, p 125-

Descriptors: *Pollutants, *Water pollution, Farm wastes, Soil erosion, Pesticides, Fertilizers, Nutrients, *Soil contamination, Water pollution

Municipal, industrial and agricultural wastes are major causes of pollution and all three must even-tually be moderated if the purity of our lakes and rivers is to be restored or maintained. Especially troublesome are agricultural sources: animal wastes, eroded soil, fertilizers, and pesticides. The disposal of organic wastes from farm animals and from other sources related to the farm enterprise has become a major management problem. If land disposal of wastes is to be used, soil type, topog-raphy, and land avialability should be carefully considered when locating feedlots and processing operations. Terracing, minimum tillage, and land covers are means of combating soil erosion. Phosphatic fertilizers should be incorporated into the soil, if possible, in order to prevent it from being carried by runoff to surface waters. Measures should be taken to prevent nitrogen in fertil-izers and organic wastes from entering surface and groundwater supplies. Pesticides must be realisti-cally evaluated. It is likely that these potentially harmful compounds have benefits that far outweigh their detrimental effects. (Cameron-East Central Oklahoma State)

Group 5C-Effects Of Pollution

NATURE AND HISTORY OF THE NITRATE PROBLEM, Missouri Univ., Columbia, Dept. of Veterniary

Medicine and Surgery. For primary bibliographic entry see Field 5B. W76-01033

CATTLE FEEDLOT POLLUTION STUDY, Texas Tech. Univ., Lubbocks. Dept. of Agrono-For primary bibliographic entry see Field 5E. W76-01045

ROLE OF BACTERIA IN BIOACCUMULATION OF MERCURY IN THE OYSTER CRASSOSTREA VIRGINICA,
Maryland Univ., College Park. Dept. of

Microbiology.
For primary bibliographic entry see Field 5B.
W76-01102

CONGENITAL ABNORMALITIES IN METHYL-

MERCURY POISONING, New Jersey School of Medicine, Newark, Dept. of S H Gilani

Environmental Research, Vol 9, p 128-134, 1975. 5 fig. 3 tab. 15 ref.

Descriptors: "Heavy metals, "Mercury, "Pollutants, "Toxicity, "Embryonic growth stage, Deformation, Poisons, Environmental effects, Animal pathology, Incubation.

Identifiers: *Congenital abnormalities, *Chicken *Methylmercuric embryos, chloride. *Teratogenic, *Embryolethal, Malformation, Embryogenesis.

A study is described of the malformation of chicken embryos due to methylmercury poisoning. Methylmercuric chloride was dissolved in sodium bicarbonate (0.2%) and administered to chick embryos at doses ranging from 0.0009 to 0.010 mg per egg. Injections were made into two groups of 420 eggs. Group A received injections on the second day of incubation, while group B received injections on the third day. On the seventh day of incubation, the embryos were examined, treated and stored. Results show that methylmercuric chloride was both teratogenic and embryolethal. Percent survival in group B was higher than group A, but the incidence of gross abnormalities was the same for both groups. Beak defects, exencephaly, shortened and twisted neck, reduced body size, microphthalmia, everted viscera, and hemorrhage all over the body were the major malformations observed. (Davis-Vanderbilt) W76-01103

IMPACT OF NITRATE FERTILIZER RESTRICTIONS ON SALT RIVER PROJECT AND ROOSEVELT WATER CONSERVATION DIS-TRICT GROWERS,

Arizona Univ., Tucson. Dept. of Agricultural Economics. D F Schoneman

Master of Science Thesis, 1974. 130 p, 5 fig, 40 tab, 41 ref.

*Fertilizers, *Crop production Descriptors: *Arizona, *Nitrates, *Economic impact, Field crops, Water pollution sources, Soil erosion, Soil management, Adoption of practices, Agricultural chemicals, Agriculture, Nitrogen, Farm prices,

Regulations.

Identifiers: *Salt River Project District(Ariz),

Identifiers: *Salt River Project District(Ariz). *Roosevelt Water Conservation District(Ariz).

Utilizing a procedure incorporating production functions and a linear programming formulation, the impact of government efforts to control farm pollution by restricting the use of nitrate fertilizers was studied for its effect on growers in the Salt River and Roosevelt Water Conservation areas. Enforcement of strict fertilizer restrictions could reduce the growers net revenue, but restrictions set at recommended agronomic levels could effect increased efficiency by some growers. Limitations this research are dicussed. (McLachlan-Arizona) W76-01114

PRELIMINARY INVESTIGATIONS ON MUTUAL GROWTH RELATIONS OF THE POPU-LATIONS OF THE BLUE-GREEN ALGA MICROCYSTIS AERUGINOSA AND GREEN ALGAE MONORAPHIDIUM MINUTUM AND SCENEDESMUS ABUNDANS IN BICULTURES, Instytut Przyrodniczych Podstaw, Lublin (Poland). Produkeji Roslinnej RA. A. Krzywicka, and D. Krupa. Acta Hydrobiologica, Vol 17, No 1, p 81-88, 1975.

2 fig, 1 tab, 19 ref.

Descriptors: *Symbiosis. *Reproduction. *Cyanophyta, *Chlorophyta, Cultures, Inhibition. Identifiers: Identifiers: *Microcystic aeruginosa,
*Scenedesmus abundans, *Monoraphidium minu-

Bicultures of the blue-grass alga Microcystis aeruginosa with common species of green algae were grown under laboratory conditions to determine if there was a relationship between growth of the populations of these two species. During a 16 day biculture, cell numbers of Monoraphidium minutum and Scenedesmus abundans increased much faster than Microcystis aeruginosa. Independent of initial cell numbers of the individual species, proportions changed toward the end of culture in favor of green algae. When the initial proportion of blue-green and green algae was 1:1, the final proportion was 1 Microcystis to 30 Monoraphidium or 1 Microcystis to 22 Scenedesmus. A monoculture control of Microcystis aeruginosa had a larger cell number after 16 days culture than mixed cultures, and there were more reduplications of cell numbers. In bicultures with an initial majority of bluegreen algae, the number of reduplications of cell number of both blue-green and green algae was lower than in cultures with other initial proportions, indicating that the generation period of the two species was prolonged. These results suggest that Microcystis blooms in lakes can take place only under conditions unfavorable for green algae. (Buchanan-Davidson--Wisconsin) W76-01140

SEASONAL VARIATION OF MANGANESE IN A EUTROPHIC LAKE,

Skidmore Coll., Saratoga Springs, N.Y. Dept. of H H Howard and S W Chisholm

American Midland Naturalist, Vol 93, No 1, p 188-197, 1975. 2 fig, 29 ref.

Descriptors: *Fluctuations, *Manganese, Eutrophication, Lakes, New York, Stratification, Turnovers, Surface waters, Hypolimnion, Cycling nutrients, Anaerobic condi-

Identifiers: *Round Lake(NY)

To understand seasonal manganese availability in a eutrophic lake and determine the influence of stratification and overturn on manganese, Mn con-centrations were measured for 15 months in Round Lake, New York. Manganese concentra-tion was 0.014-0.108 ppm in surface waters and 0.042-2.49 ppm in bottom waters. The concentra-tion pattern varied as the lake alternated between overturn and stagnation. Under anaerobic condi-tions, essentially 100% of manganese passed through a 0.45 micron membrane filter. Winter and summer maximum concentrations were about the same at 1-4 m, but at 5-7 m summer maxima were 2-6 times higher than winter maxima. Epilimnion values decreased 73% immediately after autumn overturn to low values before ice cover. After stratification, manganese concentrations rose in

bottom waters until overturn began. Accumulation at 7 m was rapid at first, then slowed. Accumula-tion in bottom waters was 0.009-0.026 mg/1/day. Assuming values at 1-2 m during summer to be minimal, overturn raised the concentrations for about 6 weeks in spring-summer and 2-3 months in autumn. Blue-green algae were always dominant. Total manganese varied from 174 kg after spring overturn to 2553 kg at end of summer stratification. Possible effects of manganese cycling on organisms and other nutrients are discussed. (Buchanan-Davidson--Wisconsin) W76-01142

WATER QUALITY AND PHYTOPLANKTON PRODUCTIVITY OF SUMMERSVILLE RESER-

VOIR, West Virginia Univ., Morgantown. Dept. of Biolo-

gy. I. E. Fraser. Proceedings West Virginia Academy of Science, Vol 8, p 8-16, 1974. 4 fig, 1 tab, 17 ref.

Descriptors: *Water quality, *Physicial *West *Phytoplankton, *Primary productivity, *West Virginia, *Reservoirs, Thermal stratification, Epilimnion, Hypolimnion, Oxygen, Hydrogen ion concentra-tion, Light penetration, Conductivity, Alkalinity, Photosynthesis, Carbon, Limiting factors, Aerobic conditions, Mesotrophy.
Identifiers: *Summersville Reservoir(W Va).

Limnological studies of Summersville Reservoir, West Virginia, were conducted from September 1971-October 1972. This seven-year-old reservoir was thermally stratified in summer; the epilimnion was approximately 6 m deep. There was no distinct isothermal hypolimnion. Oxygen was not depleted. The oxygen curve was orthograde in summer but became a clinograde curve after the maximum production peak. Light transmission (1% level) varied from 4-12 m. Conductivity was low. Hydrogen ion concentration ranged from 6.3-7.3, with highest values at the surface. Mean alkalinity was 3.12 mg/l as calcium carbonate. Total inorganic carbon was 1.80-4.92 mg C/1. Carbon fixation ranged from 0.0-842.91 mg C/cu m/day. Aereal production ranged from 3.48-3176.16 mg C/sq m/day; total annual areal production was 170.11 g C/sq m. There was a small spring phytoplankton production peak with maximum production of 217.60, and a summer peak with 842.91 mg C/cu m/day. On high productivity days, the vertical assimilation curve had an epilimnic assimilation maximum followed by a rapid decline. On sunny summer days with high transparency. the curve had both epilimnic and metalimnic maxima. Algal growth was more light-limited than nutrient limited. The lake is considered mesotrophic. (Buchanan-Davidson-Wisconsin) W76-01143

PHOSPHORUS IN SURFACE RUNOFF FROM A DECIDUOUS FOREST, Minnesota Univ., St. Paul. Dept. of Soil Science.

For primary bibliographic entry see Field 5B. W76-01145

NITRATE, PHOSPHORUS, AND SULFATE IN SUBSURFACE DRAINAGE WATER, Iowa State Univ., Ames. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 5B. W76-01146

EVALUATION OF ARTIFICIAL DESTRATIFICATION FOR CONTROL OF

ALGAL BLOOMS, Tetra Tech, Inc., Lafayette, Calif. M. W. Lorenzen, and R. Mitchell. Journal American Water Works Association, Vol 67, No 7, p 373-376, 1975. 7 fig, 1 tab, 12 ref. *Water quality control, *Mathematical models, *Algal control, Limiting factors, Light penetration, New Hampshire, Forecasting, Mathematical models. *Destratification, *Probability, Identifiers: Kezar Lake(NH).

To evaluate the suitability of a lake for artificial destratification for control of algal blooms, a diagram plotting peak algal biomass as a function of mixed depth for both nutrient and light limitations is needed. Studies of eutrophic Kezar Lake, New Hampshire, which was destratified in 1968, 1969, and 1970 with compressed air, were used to evaluand 1970 with compressed air, were used to evaluate a model developed to predict effects of artificial destratification on algal production in impoundments. The model considered both nutrient depletion and light limitation as potential biomass limiting factors. These were combined to deter-mine the upper limit to biomass production as a function of mixed depth. Nutrient limitation was the capacity to produce biomass before some es-sential nutrients were exhausted. Biomass limitasemian nutrieurs were exhausted. Blomass minuta-tion by available light was determined by evaluat-ing the balance between photosynthesis and respiration in the water column. Artificial destratification did not increase algal biomass and total peak biomass was lower during continuous aeration. Because total biomass was reduced when the mixed layer depth was increased, algal cell concentration was reduced. Apparently the algae were unable to use available nutrients when artifi-cially mixed. Results suggested that available light limited peak biomass. (Buchanan-Davidsonlimited peak Wisconsin)

USE OF WATERHYACINTHS TO REMOVE NITROGEN AND PHOSPHORUS FROM EUTROPHIC WATERS,

Louisiana Agricultural Experiment Station, Baton

Rouge. E. P. Dunigan, R. A. Phelan, and Z. H.

Hyacinth Control Journal, Vol 13, June, p 59-61, 1975. 2 fig, 1 tab, 12 ref.

Descriptors: *Nutrient removal, *Water hyacinth, *Aquatic plants, Nitrogen compounds, Phosphorus compounds, Ponds, On-site tests, Louisiana, Laboratory tests

Water hyacinths were grown in the greenhouse in six liters of water containing either 0.3 g (50 ppm), 0.6 g (100 ppm), or 1.5 g (250 ppm) nitrogen ophosphorus as ammonium chloride-nitrogen, potassium nitrate-nitrogen, or potassium hydrogen hosphate, phosphate, phosphate, phosphate (50) phosphate-phosphorus. Ammonium-nitrogen (50 or 100 ppm) was completely gone in 15 and 21 days; nitrate-nitrogen (50 ppm) was removed in 23 days. Large losses of ammonium-nitrogen and nitrate-nitrogen also occurred within 35 days at the higher concentrations. About 80, 150, and 210 mg of phosphate-phophorus were removed from water containing 50, 100, and 250 ppm phosphorus. At the highest level, phosphorus was apparently released to the water during the first three weeks of the experiment. Field studies were conducted at two farm ponds near Baton Rouge and St. Gabriel, Louisiana, using bottomless bar-rels set in pond sediment. The tests indicated that water hyacinths increased the rate at which ammonium-nitrogen was lost from pond waters. They were completely ineffective in reducing nitratenitrogen and of minimal value in phosphatephosphorus losses. Observed nitrate and phosphate concentrations decreases were due to denitrification, adsorption, and other mechanisms. (Buchanan-Davidson--Wisconsin) W76-01148

LIGHT, NITROGEN, AND PHOSPHORUS LIMITATION OF EDAPHIC ALGAE IN A DELAWARE SALT MARSH, Cook Coll., New Brunswick, N. J. Dept. of Entomology and Economic Zoology. M. J. Sullivan, and F. C. Daiber.

Journal of Experimental Marine Biology and Ecology, Vol 18, p 79-88, 1975. 3 tab, 13 ref.

Descriptors: *Benthic flora, *Limiting factors, *Algae, *Salt marshes, *Light intensity, Nitrogen, Phosphorus, Delaware, Tidal effects, Productivity, Standing crops, Cycles, Chlorophyll, Diatoms. Identifiers: Canary Creek(Dela.), Spartina alterniflora, Delaware Estuary.

The environmental factors which regulate the production and species composition of the edaphic algal standing crop during the yearly cycle, the effects of changing light intensity and adding inor-ganic nitrogen and phosphorus as fertilizer to the surface of the Canary Creek salt marsh, Lewes, Delaware, were studied on algae associated with a pure stand of cord grass, Spartina alterniflora. The standing crop of edaphic algae, measured by chlorophyll-a production, was limited by phosphorus during the fall and winter, by both phosphorus and nitrogen in the spring, and only by nitrogen in the summer. Responses were in phase with seasonal fluctuations of phosphorus and nitrogen, thus it is concluded that the flood tide was the major source of nitrogen and phosphorus compounds for the algal growth. Reduction in the amount of light reaching the algae because of the Spartina cover was always a limiting factor for the standing crop. A gradient in algal flora composition was directly related to light intensity, and indicated that light intensity determined the relative the community. In the Delaware salt marshes and further north, only the algal component remains functional throughout a yearly cycle and a signifi-cant portion of its production is at a time when the grasses are dormant. (Buchanan-Davidson-Wisconsin) W76-01149

ALGAE OF DAM RESERVOIRS IN THE SOLA CASCADE AND NEIGHBOURING SECTORS OF

Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.

K. Kyselowa, and L. Krzeczkowska-Woloszyn Acta Hydrobiologica, Vol 16, No 3-4, p 401-416, 1974. 4 fig, 3 tab, 15 ref.

Descriptors: *Algae, *Reservoirs, *Seston, *Periphyton, Rivers, Eutrophication, Self-purification, Sphaerotilus, Aquatic bacteria, Diatoms, Cyanophyta, Dominant organisms, Water pollu-tion effects, Chrysophyta, Plankton, Euglenophyta, Europe.

Identifiers: Cascade reservoirs, Sola River(Poland), Porabka Reservoir(Poland), Tresna Reservoir(Poland), Czaniec Reservoir(Poland).

The influence of damming the Sola River, Poland, on seston and periphyton communities of the river and plankton of the reservoirs was studied. Above the Tresna Reservoir, Sphaerotilus natans, other bacteria, and colorless flagellata were observed on the left bank, and diatoms and blue-green algae on the right bank. These differences may have been due to sewage inflow. The periphyton and seston indicated pollution in this area. Below the dam a few Sphaerotilus natans were observed and the periphyton composition indicated less pollution. In the three reservoirs Chrysophyceae were domi-nant in May, Bacilariophyceae in July and Sep-tember, and algal numbers decreased in Sep-tember. Algal numbers in the cascade did not change, but there was uneven development of cerchange, but there was uneven development of cer-tain algae, suggesting a decrease in eutrophication; however the types of algae were characteristic for waters with organic pollution. Water above the reservoir was more polluted than that below, in-dicating the influence of reservoirs on river purity. Dam reservoirs created favorable conditions for development of planktonic algae which are impor-tant in self-purification. Planktonic species developing in these reservoirs were found in sestion below the reservoirs. Diatoms originating in the river were observed in the reservoir plankton. (Buchanan-Davidson--Wisconsin)

W76-01150

NUTRIENTS AND ALGAE IN SOME CENTRAL IOWA STREAMS, Iowa State Univ., Ames. Dept. of Zoology and En-

S. P. Kilkus, J. D. LaPerriere, and R. W.

Journal Water Pollution Control Federation, Vol 47, No 7, p 1870-1879, 1975. 8 fig, 2 tab, 25 ref.

*Euthrophication, Descriptors: Descriptors: *Euthrophication, *Nutrients, *Algae, *Streams, Rivers, Iowa, Streamflow, Water pollution sources, Phosphorus compounds, Nitrogen compounds, Diatoms, Mathematical stu-

Suspended algae and plant nutrients were measured in streams near Ames, Iowa. Nutrient levels were high averaging, 0.16 mg/l orthophosphate phosphorus, 0.54 mg/l ammonia nitrogen, and 1.75 mg/l nitrate nitrogen. Correlations between phosphate, ammonia nitrogen, and nitrate nitrogen. and adjusted flows were significant and positive; correlations between human population densities and ammonia nitrogen and nitrate nitrogen were not. A significant correlation with orthophosphate phosphorus and human population was found, however, but phosphorus sources unrelated to urban density were of greater importance. Con-centrations of phosphate nitrate, and ammonia increased with increase in flow. Removal of creased with increase in flow. Removal of phosphorus from wastewater effluents through tertiary treatment would have little effect on nutrient concentrations. Logarithmic average mean algal populations were 54.7 mg chlorophylla/cu m and 24,500 cells/ml. Diatoms were dominant, followed by Scenedesmus and Oscillatoria. The larger the watershed, the higher the average chlorophyll-a concentration. High algal chlorophyll levels were associated with low flow periods. Algal carbon-14 uptake was not stimu-lated when phosphorus or nitrogen were added. Algae did not reduce phosphorus and nitrogen to limiting levels during flow; volume of flow. drainage area, and temperature were associated with 50% of chlorophyll-a variance. (Buchanan-Davidson-Wisconsin). W76-01152

A STUDY OF THE BENTHIC ALGAE IN THE KELP BED OFF DEL MONTE BEACH, MON-

Naval Postgraduate School, Monterey, Calif. J. L. Keithly.

Available from the National Technical Information Service, Springfield Va 22161 as AD/A-005 465. MS thesis, December 1974. 143 p, 17 fig, 7 tab, 22 ref, 5 append.

Descriptors: *Marine algae, *Benthic *Kelps, Coasts, California, Varieties, Periphyton, Distribution patterns, Surveys, Mapping.

Identifiers: *Del Monte Beach(Calif), *Monterey(Calif)

Approximately 50 benthic algal species and one eel grass specie were collected and identified. When 13 of the most abundant and/or easily recognized genera were classified into five floral groups according to taxonomy and height and mapped if they were found in pre-selected quadrat sites, abundance of each genera group was less in large sand covered shale areas, greater near shale ledge edge areas, and dependent on genera grouping when within Macrocystis 'hold-fast near field areas.' The mean number of stipes counted per holdfast decreased between winter and summer collections. Aerial photography over a five year period revealed that the kelp canopy showed a substantial size increase between October 1971-December 1972. Kelp beds near the city of Monterey sewer outfall appeared to be receding into deeper water from October 1971-January 1974. Theoretical wave refraction energy computations appeared consistent with the presence of Zostera

Group 5C-Effects Of Pollution

and the best developed Cystoseira and Dictyoneu-ropsis in predicted calm water areas, as well as presence of Nereocystis and Pterygophora in predicted high wave energy areas. A species list and their ecological distribution is appended. (Buchanan-Davidson--Wisconsin)

SODIUM: A FACTOR IN GROWTH OF BLUE-GREEN ALGAE, Michigan State Univ., East Lansing. Dept. of

Botany. A. K. Ward

Available from the National Technical Information Service Springfield, Va 22161 as COO 1599 84, \$4.00 in paper copy, \$2.25 in microfiche. MS thesis, 1974. 48 p, 11 fig, 2 tab, 38 ref. AEC AT-(11-1)-1599, COO-1599-84.

Descriptors: *Algae, *Cyanophyta, *Sodium, *Inhibition, Growth rates, Anabaena, Nitrates, Nitrogen, Carbon, Metabolism, Laboratory tests, Nitrogen (kaibon, Medaorisin, kabotatory tests, Nitrogen fixation, Sodium chloride, Photosynthes-is, On-site tests, Michigan, Limiting factors. Identifiers: Anabaena cylindrica, Organic carbon excretion, Wintergreen Lake

Response of axenic cultures of Anabaena cylindrica to sodium and nitrate was examined, with special emphasis on aspects of nitrogen and carbon metabolism. In situ sodium enrichment bioassays were employed to ascertain response of natural populations of heterocystous blue-green algae to sodium additions. Acetylene reduction was used to compare nitrogen-fixing ability of blue-green algae. Assimilation of inorganic radioactive carbon was used to determine photosynthetic carbon fixation rates. With no added sodium chloride, cultures showed decreased acetylene reduction, C14 assimilation. carbon organic excretion. chlorophyll-a, and particulate organic carbon compared to cultures with added sodium. Sodium deficient cultures released more previously fixed carbon as organic carbon. No differences were demonstrated with higher sodium concentrations. High nitrate concentrations caused decreased rates of acetylene reduction and heterocyst numbers in sodium sufficient and sodium deficient cultures; decreased particulate organic nitrogen content at high nitrate levels occurred only in sodium deficient cultures. Higher percentages of excreted organic carbon occurred with increasing nitrate concentrations in sodium deficient cultures. Sodium enrichment bioassays in Wintergreen Lake, Michigan, indicated increased photosynthetic carbon fixation with small additions of sodium but higher concentrations had no effect. No increase in in situ acetylene reduction rates occurred among natural populations with added sodium. (Buchanan-Davidson--Wisconsin) W76-01156

PHYTOPLANKTON COMPOSITION OF SMALL SUBARCTIC !AKE IN T. NORTHWEST TERRITORIES, CANADA, Toronto Univ. (Ontario). Dept. of Botany.

R. Sheath, and M. Munawar. Phycologia, Vol 13, No 2, p 149-161, 1974. 3 fig, 2 plates, 1 tab, 61 ref.

Descriptors: *Biological con *Phytoplankton, *Subarctic, *Lakes, communities. Canada, Phytoplankton, "Subarctic, "Lakes, Canada, Varieties, Speciation, Diatoms, Chlorophyta, Cyanophyta, Dinoflagellates, Euglena, Chrysophyta, Plant morphology, Pyrrophyta, Nannonplankton, Trophic level.
Identifiers: "Hanna Lake(Canada), Norman Wells(Northwest Territories).

A qualitative survey of phytoplankton is subarctic Hanna Lake, near Norman Wells, Northwest Territories, showed that during the ice-free period, there were 81 common taxa. Major groups accounting for 83.9% of the total species were Diatomeae, Chlorophyta, and Cyanophyta. Chrysomonads, cryptomonads, Heterokontae, and dinoflagellates comprised 16% of the species. There were no Euglenophyta. Dominating morphological forms were nonmotile unicells and colonies; 12% were phytoflagellates and 14% filamentous. Comparisons with other subarctic and arctic lakes indicated that diversity of taxonomic groups and morphological forms was not restricted by increasing latitudes. Nanoplankton species out numbered net plankton. Of the net plankton, 62% were filamentous blue-green algae and diatoms. Of the nanoplankton, the largest group was the 21-40 micrometer size. The only ultraplankton was Er-kenia subacquiciliata. Phytoplankton quotients were: Myxophycean 3.2, Chlorophycean 2.5, diatom 0, and compound 5.7; except for the diatom quotient, these were in the range for eutrophic lakes. Algal species numbers were very ephemeral. Concurrent with a decrease in diatom epnemeral. Concurrent with a decrease in datom numbers, a rapid increase in species numbers (primarily Chlorophyta and Cyanophyta) occurred during the summer. Eutrophic conditions appeared to occur naturally in this lake, as shown by nutrient levels, species composition, phytoplank ton quotients, and ration of net plank-ton/nanoplankton. (Buchanan-Davidson--Wisconsin) W76-01157

THE RAPID QUANTITATION OF THE FILA-MENTOUS MENTOUS BLUE-GREEN ALGA PLEC-TONEMA BORYANUM BY THE LUCIFERASE ASSAY FOR ATP.

Delaware State Coll., Dover. Dept. of Biology. V. H. Bush.

Available from the National Technical Information Service, Springfield, Va 22161, as N74 33527, \$3.50 in paper copy, \$2.25 in microfiche. Report 1974. 20 p, 4 fig, 4 tab, 7 ref. NASA 08002-003.

Descriptors: *Analytical techniques, *Biomass, *Algae, Cyanophyta, Measurement, Population,

Identifiers: *Luciferase, Plectonema boryanum,

Adenosine triphosphate.

Microscopic cell counts, luciferase assay for ATP, and optical density measurements were used to quantitatively measure populations of Plectonema boryanum, a filamentous blue-green alga. Disruption of the gelatinous sheath without disrupting the cells is a prerequisite for accurate cell counting, various physical and chemical means (ultrasonic sound, heat, freezing, nitric acid, pineapple juice, sodium hydroxide, Triton X-100) were unsuccessful. When five-day-old cultures of P. boryanum were diluted with growth medium, there was a linear relationship between the three methods and algal population but the luciferase method for determining ATP was the most rapid and accurate. ATP was determined by extracting tle cells with 2N nitric acid, and amount of ex-tractable ATP measured by the bioluminescent firefly luciferase reaction. This study was limited to P. boryanum of a given age and grown under specified conditions. Wisconsin) (Buchanan-Davidson-

CHEMICAL AND MICROBIOLOGICAL STU-DIES OF THE MIDDLE SALT LAGOON, BAR-ROW, ALASKA, Colorado State Univ., Fort Collins. Dept. of

Microbiology.

W. L. Boyd, and J. W. Boyd.

Available from the National Technical Information Service, Springfield, Va 22161, as ADA-001 229, \$4.00 in paper copy, \$2.25 in microfiche. Final Report September 1974. 45 p, 5 fig, 14 tab, 19 ref. ONR NOOO14-67A-0299-0015.

Descriptors: *Saline lakes, *Chemical properties, *Arctic, *Biota, Alaska, Bacteria, Sewage effluents, Optical properties, Lagoons, Runoff, Bottom sediments, Halophytes. Identifiers: Middle Salt Lagoon(Alaska), Barrow(Alaska).

The ecology of a salt lagoon, adjacent to Chukchi Sea, was studied in 1971-1972 before installation of a sewage treatment plant. The lagoon was used as a depository for sewage from the Naval Arctic Research Laboratory. Although it seemed like an ideal component of a two cell disposal system, with concentration during winter and dilution into the sea in summer, this was not the case. Little sludge flushed out of the main basin during runoff. studge flushed out of the main basin during flunoff. Runoff and melt water flowed over denser layers, probably resulting in a greater dilution after the sea channel had been closed. A slow turnover rate of soluble bottom material occurred for 2-3 months. Phosphorus concentration was low except at the sewage outfall and there was no evidence of eutrophication despite the use of detergents. Ammonianitrogen was high, but nitrate- and nitrite-nitrogen were only found occassionally in shallow areas. Pollution indicator organisms were low, except in bottom sediments because of the outfall design. Marine and halophilic bacteria were sig-nificant during the ice-free period. The lagoon had no odor and was clear except near the bottom. Most of the microbial populations were associated with bottom sediments. (Buchanan-Davidson-

BLOOMS OF SURF-ZONE DIATOMS ALONG THE COAST OF THE OLYMPIC PENINSULA, WASHGINTON, V. ENVIRONMENTAL CONDI-TIONS ASSOCIATED WITH THE BLOOMS (1971 AND 1972),

Washington Univ., Seattle. Dept. of Oceanog-

J. Lewin, T. Hruby, and D. Mackas. Estuarine and Coastal Marine Science, Vol 3, No 2, p 229-241, 1975. 7 fig, 1 plate, 15 ref. NSF GA-27498, AEC AT(45-1) 2225, TA26.

Descriptors: *Ecological distribution, *Marine algae, *Diatoms, *Surf, Washington, Pacific Coast Region, Coasts, Phosphates, Salinity, Water tem-perature, Nutrients, Nitrates, Silicates, Diurnal distribution, Ammonia.

Identifiers: Surf diatoms, Copalis Beach(Wash.), Chaetoceros armatum, Asterionella socialis, Bid-dulphia aurita, Olympic Peninsula(Wash.).

Environmental conditions associated with heavy diatom blooms in 1971-2 at Copalis Beach, Washington, were monitored. Chaetoceros armatum was always present; Asterionella socialis disappeared in late summer and autumn of 1972 when there was upwelling of oceanic water. Bid-dulphia aurita (of minor importance in blooms) dulpha aurita (or minor importance in blooms) was present in late winter and spring. These species are physiologically adaptable and are able to tolerate and grow in widely fluctuating temperatures, salinity, light, and nutrient levels. During April, salinity was low, silicate high, and nitrate decreased due to mixing of ocean and river waters which were both low in nitrate. Duration of nitrate depletion depended on intensity of deep oceanic water upwelling (influenced by magnitude and du-ration of northerly winds and river runoff) Populations did not become significantly nutrient-limited; while nitrates were low ammonium was present. C. armatum nitrate reductase was low when nitrate was absent in summer. Length of A. socialis disappearance depended on magnitude of upwelling, possibly caused by increase in salinity. (Buchanan-Davison--Wisconsin) W76-01160

WATER POLLUTION FROM AGRICULTURE, Kungliga Lantbrukshogskolan, Uppsala (Sweden). For primary bibliographic entry see Field 5B. W76-01162

MEASUREMENT OF ZOOPLANKTON BIOMASS BY CARBON ANALYSIS FOR APPLI-CATION IN SOUND SCATTERING MODELS, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 5A. W76-01163

PRELIMINARY LABORATORY RESEARCH IN

PRELIMINARY LABORATORY RESEARCH IN EXPERIMENTAL BRACKISH ECOSYSTEMS, J-C. Lacaze, C. Hallopeau, and M. Voight. Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 796-T, \$3.50 in paper copy, \$2.25 in microfiche. EPA-TR 58-75, 1974. 15 p, 3 fig, 32 ref. Translated from Bulletin du Museum National d'Histoire Naturelle, Series 2, Vol 41, No 5, p 1278-1289, 1969.

Descriptors: *Water pollution effects, *Brackish water, *Laboratory tests, *Ecosystems, Europe, Aquatic animals, Aquatic plants, Diatoms, Biological communities, Periphyton. Identifiers: France.

Brackish ecosystems for water pollution biassay were established in tanks filled with diluted sea water, kept at 19C, lighted for 12 hours, and water, kepi at 19C, institute to 12 nours, and treated with sediment and biocenoses from the Ar-cachon Basin ponds, France. Plant material con-sisted of Chaetomorpha lineum and Cladophora parriendii, which sheltered abundant fauna. During the year Spirulina subsalsa repeatedly bloomed and some Chaetomorpha decayed. After a year Spirulina subsales, Oscillatoria chalybea, Lyngbya lutea, Ulvella, Exuviella, and diatoms were established. Much of the microflora epiphytes of Chaetomorpha and Cladophora disappeared and a new characteristic macroflora developed. Another diatom community was established in the Spirulina matting which was rich in organic matter from Chaetomorpha decomposition. There were macrofauna and microfauna. All macrofauna species brought with the algae were supported, but adult forms seemed less numerous than young forms and some species underwent a dramatic development, e.g., Sagartia. During the first three months numerous species disappeared. Spirulae caused alternating periods of growth and degeneration, with the variations in algal development and phosphate concentrations synchronized. After four months, the periphyton was more diver-sified and persistent and Spirulina developed, essentially destroying Chaetomorpha and Cladophora. A characteristic flora established itself in the spirulae mollusks. (Buchanan-Davidson-Wisconsin) W76-01165

NUTRIENT AND PHYTOPLANKTON STUDIES OF LLANGORSE LAKE, A EUTROPHIC LAKE IN THE BRECON BEACONS NATIONAL PARK,

Trent Univ., Peterborough (Ontario). Dept. of Biology.

R. Jones, and K. Benson-Evans.

ophyceae.

Field Studies, Vol 4, No 1, p 61-75, 1974. 8 fig, 5 tab. 19 ref.

Descriptors: *Nutrients, *Phytoplankton, Peterophication, Lakes, Water temperature, Europe, Silica, Diatoms, Phosphates, Hardness(Water), Nitrites, Growth rates, Period of growth, Varieties, Cyanophyta, Chlorophyta, Temporal distribution, Ammonia, Calcium, Magazir nesium Identifiers: *Llangorse Lake(Wales), Myx-

Considerable recreational stress is placed on this lake due to its proximity to large industrial areas of South Wales and the Midlands. Data collected in 1961-1962 and in 1966-1967 concerning nutrients and phytoplankton are compared. This shallow lake is almost homothermal. The pH increases in summer and early autumn. Nutrient levels in the inflowing river, Afon Llynfi, remained relatively constant except during high volume in winter. Silica concentration rose to a maximum in late summer and autumn, but winter diatoms caused depletion. Phosphate was high in early summer and low in winter; the phosphate level had in-creased between 1961 and 1966. Total hardness was constant except when diluted by winter rains. Nitrites reached a peak in early summer and in early winter in Afon Llynfi. Maximum

phytoplankton growth was associated with high lake water temperatures and macronutrient concentrations. Periodicity in major phytoplankton species is detailed. The winter burst of diatoms as followed by a spring increase of green algae. Increasing lake water temperatures and hydrogen ion concentrations in late summer were associated with increases in Cyanophyta. Microcystis flosaquae blooms were noted in both years, but the bloom was twice as high in 1966 as in 1961. Species of phytoplankton, epiphytes, and epiliths are given. (Buchanan-Davidson-Wisconsin) W76-01167

COMMUNITIES OF THE PERIPHYTON ALGAE OF CHANNEL LAKES OF BYSZEWO, Nicolas Copernicus Univ. of Torun (Poland). Dept. of Systematics and Plant Geography. M. Luscinska.

Acta Universitatis Nicolai Copernici, Limnological Paper No 8, p 35-45, 1974. 5 fig, 3 tab, 4 ref.

*Biological *Periphyton, *Aquatic algae, Water quality, Lakes, Systematics, Mesotrophy, Spring, Lakes, Systematics, Chlorophyta, Hardness(Water), Summer, Littoral. Calcium Identifiers: *Byszewo lakes(Poland).

One hundred and fifty one periphyton taxa were found in the littoral zone of 10 channel lakes of Byszewo, Poland, of which 32 were planktonic or benthic. Most of the components of these commu-nities were diatoms and adhered to the larger algae of the upper layers; others were attached to sub strata. The second largest group was the Chlorophyceae, most of the them belonging to the Chactophorales. Most of the taxa were characteristic of the periphyton of eutrophic lakes. Periphyton collected in May from young reeds and those growing from last year's reeds showed only slight differences. In September some filamentous algae were found which were not found in May. The association of Oedogonio-Epithemietum li-toralae indicated the high purity of the littoral waters. This association is characteristic of eutrophic lakes rich in calcium but unpolluted with nutrients and organic substances. (Buchanan-Davidson--Wisconsin). W76-01168

PHOSPHODUS IN NEW YORK STATE DIVERS. SOURCES, SINKS, AND DETERGENTS, State Univ. of New York at Binghamton. Dept. of Chemistry.

For primary bibliographic entry see Field 5B. W76-01170

PHYTOPLANKTON SUCCESSIONS AND SPE-CIES DISTRIBUTION IN PRAIRIE PONDS OF THE ERICKSON-ELPHINSTONE DISTRICT, SOUTHWESTERN MANITOBA.

H. Kling. Canada Department of the Environment, Fisheries and Marine Service Technical Report No 512, 1975. 33 p, 5 fig, 2 tab, 28 ref.

*Succession, Descriptors: *Phytoplankton, *Varieties, *Distribution, *Potholes, Canada, Trophic level, Euthrophication, Biomass, Dominant organisms.

Identifiers: Erickson-Elphinstone(Manitoba)

Phytoplankton of 50 small prairie pothole lakes in the Erickson-Elphinstone region of Manitoba have been surveyed since 1972. Seasonal succession studies were conducted in five lakes in 1973. These lakes are very eutrophic with midsummer maximum biomass values above 10,000 mg/cu m. The phytoplankton were mainly Cyanophyta. Peridinae became dominant in a few lakes during certain years, although they were usually of minor importance. When dominant, Ceratium hirundinelwas the only species present. A total of 237 taxa

were identified in these lakes from 1972-1974. It would appear that the more eutrophic the lake, the fewer species were present. Spring and fall samples generally contained more species than summer and winter samples. These lakes could be generally classified as having mesotrophic or eutrophic dinoflagellate plankton, eutrophic chloroccal plankton, and cyanophycean plankton. When the lakes were compared on the basis of When the lakes were compared on the basis of their summer maximum biomass and predominance of various algal groups, there was increased predominance of Cyanophyta of Chlorophyta as the lakes became more eutrophic (indicated by areas which increased biomass). Those with lower biomass values and nutrients showed a predominance of Chrysophycae. The Erickson-Elphinstone lakes are highly eutrophic with high summer receipts and on the predominance of Chrysophycae. with high summer maximum biomass values and high Cyanophyta dominance. (Buchanan-Davidson-Wisconsin) W76-01171

CHANGE IN PLANKTONIC COMPLEXES IN THE EUTROPHIC LAKE BALTYM DUE TO OVERGROWTH BY WEED,
Ural and Siberian Fishery Scientific-Research and

Planning Inst. Sverdlovsk (USSR).

I V Kozlova UDC 577.472(26). Translated from Ekologiya, No 4, p 104-107, 1973. Published by Consultants Bureau, Div. of Plenum Publishing Corp, New York City. 1 tab, 5 ref.

Descriptors: *Eutrophication, *Aquatic weeds, Pescriptors: "Eutropication, "Aquate weeds,
"Phytoplankton, "Zooplankton, Rotifers,
Daphnia, Biological communities, Cyanophyta,
Chlorophyta, Biomass, Chrysophyta,
Crustaceans, Nostoc, Fish.
Identifiers: "Lake Baltym(USSR).

Changes in species composition and zooplankton development in relation to aquatic vegetation overgrowth in Lake Baltym, USSR, are discussed. Before 1950, there was little overgrowth; in 1952, aquatic vegetation spread and by 1962 occupied almost 50% of the bottom. Eutrophication occurred due to shoreline developments and absence of seine netting. Hornwort beds covered the center and some parts were solid masses of elodea, milfoil, and pondweed. In 1962 a blue-green and green algae bloom occurred. Daphnia and Mesocyclops oithonoides disappeared, and Eudiaptomus graciloides, Mesocyclops leuckarti, Bosmina mixta, Ceriodaphnia pulchella, and C. quadrangula increased. Macrophytes spread caused changes in phyto- and zooplankton communities. Blue-green algae and chrysophytes bloomed in 1965. In 1970 aquatic vegetation covered most of the lake bottom. Hornwort and Elodea were most abundant. The lake 'bloomed' with green algae, The lake bloomed with green algae, chrysophytes, and blue-green algae. Elodea, milfoil, pondweed, reeds, Nostoc, Bosmina longirostris, Ceriodaphnia pulchella, and Mesocyclops leuckarti attained high density. Eudiaptomus graciloides was low. Rotifers constituted 49.5% of total biomass. Zooplankton were low in 1970. Reduction of crustaceans indicated deteriorating growth conditions. Restoration of the planktonic food base will necessitate removal of vegetation (which suppressed many pelagic zooplankton) by stocking with phytophagous fish, Ctenopharyngodon idella and Hypophthalmichthys molitrix. (Buchanan-Davidson-Wisconsin) W76-01172

THE ALGAE OF SALINE AREAS NEAR VLISSINGEN (THE NETHERLANDS),

Leiden Rijksherbarium (Netherlands). P. J. G. Polderman. Acta Botanica Neerlandica, Vol 23, No 2, p 65-79, 1974. 5 fig, 1 tab, 27 ref.

Descriptors: *Algae, *Brackish water, *Saline water, *Vegetation, Saline water intrusion, Domimant organisms, Period of growth, Biological com-munities, Distribution patterns, Varieties, Syste-matics, Europe.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects Of Pollution

Identifiers: Vlissingen(Netherlands), Puccinellietum fasciculatae, Juncetum gerardii, Vaucheria.

Composition and periodicity of algal mats in saline seepage areas on the landward side of dikes near Vlissingen, The Netherlands, are described. Puccinellietum fasciculatae was the predominant higher plant in areas higher in salinity than those inhabited by Juncetum gerardii. Rhizoclonium riparium was usually the most important algae, but was occasionally replaced by Vaucheria. Bluegreen algae, Nodularia harveyana and Schizothrix calcicola, were always present. Some periodicity in growth of green algae, Ulothrix subflaccida and U. pseudoflacca, was observed. Algal cover often decreased at the end of May. Substrate, water regime, higher plant density, desiccation, and mode of growth influenced algal cover. Rhizoclonium grew better in summer and autumn and Ulothrix peaked in winter. Apistonema were the only algae found in salt crusts in summer. Differences in algal species composition in Juncetum gerardii and Puccinellietum fasciculatae were small. Plots could be distinguished by the Vaucheria species present. In saline areas of North Holland, only Juncetum gerardii was found. Ecological boundaries of algal species were different from those of higher plants. Classification of algae in saline environments must be based on investigations of large areas with diverse terrain made each season for several years. (Buchanan-Davidson--Wisconsin) W76-01173

SOME CARPATHIAN RESERVOIRS AND THEIR PRODUCTION RELATIONS,

Polish Academy of Sciences, Krakow (Poland). Zaklad Biologii Wod. M. Bombowna, and H. Bucka. Acta Hydrobiologica, Vol 16, No. 3-4, 1974. p 379-400, 11 fig, 4 tab, 14 ref.

Descriptors: *Reservoirs, *Productivity, Chemical properties, Phytoplankton, Primary productivity, Chlorophyll, Diatoms, Chrysophyta, Chlorophyta, organisms, Nutrients, (Basins), Phosphates, Watersheds(Basins), Waste water(Pollution), Biomass, Photosynthesis, Algae,

Identifiers: Sola cascade reservoirs(Poland), Vistula River(Poland).

Chemical relations, phytoplankton primary production, and chlorophyll content in two reservoirs of the Sola cascade and a lowland reservoir at Goczolkowice, Poland, were compared, to determine if production depended on chemical composition of water or reservoir type. Diatoms dominated the algal communities; Cyclotella comta and Cryptomonas erosa were present in all reservoirs and Chrysococcus in Goczalkowice. Green algae increased at the end of summer with Nephrochlamys Willeana in all reservoirs and Raphidonema longiseta and Dictyosphaerium pulchellum at Tresna and Porabka. Fertility de-pended on nutrient inflow from the catchment areas. Sufficient phosphates were present even in summer due to municipal waste inflows. Asterionella formosa appeared at the beginning of summer. Morphometric features did not significantly influence production in Tresna and Goczalkowice reservoirs. Chlorophyll-a concentration could be positively correlated with production and nutrient content. Phytoplankton renewal time was a good indication of photosynthetic activity. Decrease in productivity down the cascade and increase in algae characteristic of clean water at Porabka indicated a favorable response to a system of reservoirs on a river. Eutrophication was moderate, but greater in the Tresna reservoir due to a short filling period and sewage inflow from Zywiec causing less production stability than in the Goczalkowice reservoir. W76-01175 HEAVY-METAL TOLERANCE IN ALGAE FROM CONTAMINATED LAKES NEAR SUBBURY, ONTARIO, ALGAE

Toronto Univ. (Ontario). Dept. of Botany. P. M. Stokes, T. C. Hutchinson, and K. Krauter. Can J Bot. Vol 51, No 11, p 2155-2168. 1973.
Identifiers: *Algae, *Bioassay,
*Canada(Sudburg), Chlorella-Fusca-Var-Vacuolata, *Heavy metals, Copper, EDTA, Lakes, Nickel, Nutrients, Scenedesmus-Acutifor-mis-Var-Alternan, Hydrogen ion concentration.

Chemical analyses of lake waters in the Sudbury (Canada) smelting area indicated abnormally high levels of metals, especially of Cu and Ni. Two of the algal isolates from these contaminated lakes, Scenedesmus (acutiformis var. alternans) and Chlorella (fusca var vacuolata), were chosen for study. Their growth, as determined by cell er, was tested under controlled conditions in defined media. Nutrient conditions, pH, and con-centration in solution Cu and Ni were used as variables in bioassays. In comparison with laboratory strains of similar algae, in medium with no chelate (EDTA) the isolated lake strains were found to be tolerant of the heavy metals N (Scenedesmus) and Cu (Scenedesmus and Chlorella). The patterns of response to metals in solution differed markedly between laboratory and lake strains. The ecolog cal implications are considered .-- Copyright 1974, Biological Abstracts, Inc. W76-01197

STUDIES ON THE DECOMPOSITION OF A DUCKWEED (LAMNACEAE) COMMUNITY. Allegheny Coll., Meadville, Pa. Dept. of Biology.

H. R. Laube, and J. R. Wohler. Bull Torrey Bot Club. Vol 100, No 4, p 238-240. 1973. Illus.

*Decomposition, Dry manual Lemna-Trisulca, Manganese, Identifiers: *Duckweed. Magnesium, Manganese, Lemnaceae. *Pennsylvania, Sodium, Spirodela-Polyrrhize, Temperature, Wolffia-Columbiana, Ponds.

During the late summer and fall of 1971 and 1972, decomposition of even-dried duckweeds (Spirodela polyrhize, Lemna minor, L. trisulca, and, in late summer, Wolffia columbiana) returned to a small pond in northwestern Pennsylvania was monitored and samples analyzed for the loss of dry weight, organic weight, inorganic weight, M, Mn and Na. A laboratory study also performed to measure loss of the above at 10 C and 20 C. Results of these studies indicate that within one week, at least 20% of the dry matter is lost and that over 50% of the M, Mn and Na are lost within 3 weeks .-- Copyright 1974, Biological Abstracts, Inc. W76-01198

THE ALGAL MICROFLORA OF A STRING MIRE IN RELATION TO THE CHEMICAL COMPOSITION OF WATER,

Lund Univ. (Sweden). Dept. of Ecological Botany.

Can J Bot, Vol 51, No 4, p 743-749. 1973. Identifiers: *Algal species diversity, Bogs, *Chemical composition, *Desmidiales, Evastrum, Flora, Lakes, Micrasterias, Nutrients, Sphagnum-Rubellum, Stauragstrum, *String mire.

Samples (21) were examined for algal species diversity. Samples contained between one and 35 species with a mean of 10.6 species/sample. The greatest diversity of species occurred in samples collected from large flarks or bog lakes. Hummock communities, especially those with abundant Sphagnum rubellum contained fewest algae. All samples showed a predominance of Desmidiales. General ionic levels in the string mire were low; however, species of the genera Euastrum, Micrasterias and Staurastrum occurred frequently in the sites richer in nutrients. More species were found in water than in drier sites. The presence of species characteristic of more base-rich conditions may be related to the rate of water flow through

the mire .-- Copyright 1974, Biological Abstracts, W76-01200

LIMITED ARSENIC DISPERSION IN SEA WATER, SEDIMENTS, AND BIOTA NEAR A CONTINUOUS SOURCE, Fisheries and Marine Services, St. John's (Newfoundland). Biological Station. W. R. Penrose, R. Black, and M. J. Hayward.

Journal of the Fisheries Research Board of Canada, Vol 32, No 8, p 1275-1281, August 1975. 1 fig. 6 tab. 13 ref.

Descriptors: *Arsenic compounds, *Dispersion, *Sediments, *Biota, *Sea water, *Canada, *Analytical techniques, Marine biology, Sodium arsenite, Photometry, Chemistry, Color reactions, Instrumentation, Aquatic animals, Instrumentation, Aquatic animals, Oceans, Aquatic life, Testing procedures, Colorimetry, Estuarine environment, Water pollution, Water pollution sources, Path of pollutants, Mining, Mine drainage, Igneous rocks, Sedimentary rocks. Identifiers: "Moreton's Harbor, "Arsenic dispersion, Stibnite, Sea urchin, Sand dollar, Arsine,

Moreton's Harbor, Newfoundland, has been exposed to arsenic-bearing drainage and leaching from a stibnite mine for at least 38 yr and possibly longer than 84 yr. Measurements of inorganic arsenic in sea water and sediments and total arsenic in some marine organisms revealed a very limited influence of continuous exposure to arsenic in the small harbor. Arsenic concentrations in surface water declined to normal within 200 m, and in sediments within 50 m. Animals did not show significantly higher levels nearer the mine, with the exception of the sea urchin Strongylocentrotus droebachiensis, which accumulated significantly higher levels of arsenic adjacent to the mine site. W76-01262

SEDIMENTATION OF ORGANIC MATTER IN ST. MARGARET'S BAY, NOVA SCOTIA, Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab. For primary bibliographic entry see Field 2L. W76-01311

DECISION TO CONTROL EUTROPHICATION, Canada Centre for Inland Waters. Burlington (Ontario). For primary bibliographic entry see Field 5G. W76-01352

TROUT METABOLISM CHARACTERISTICS AND THE RATIONAL DESIGN OF NITRIFICA-TION FACILITIES FOR WATER REUSE IN HATCHERIES, Texas Univ. at Austin. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5D. W76-01382

REUSE OF EFFLUENT FOR AGRICULTURAL

Commonwealth Scientific and Industrial Research Organization, Camberra (Australia). Div. of Land Use Research.

For primary bibliographic entry see Field 5D. W76-01416

POLLUTION OF RECIPIENTS BY STORM RU-NOFF IN MIXED SEWER SYSTEMS: STORM RETENTION BASINS AS A REMEDY (LA POL-LUTION DES EMISSAIRES PAR LES DEVER-SEMENTS DES RESEAUX UNITARIES: UN REMEDE LES BASSINS D'ORAGE), For primary bibliographic entry see Field 5D. W76-01427

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

WATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA - LAKE ERIE, VOLUME I - SYNTHESIS, Cleaveland Dept. of Public Utilities, Ohio. Div. of

Utilities Engineering.

For primary bibliographic entry see Field 5B. W76-01500

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5D. Waste Treatment Processes

DESIGN GRAPHS FOR ACTIVATED SLUDGE

PROCESS, CH2M-Hill, Reston, Va.; and Hill (Clair A.) and Associates, Reston, Va. M. D. Mynhier, and C. P. L. Grady, Jr. Journal of the Environmental Engineering Divi-sion, American Society of Civil Engineers, Vol 101, No EE5, Proceedings paper No 11659, p 829-846, October 1975. 9 fig, 4 tab, 31 ref.

pescriptors: *Activated sludge, *Curves, *Graphs, *Environmental engineering, *Waste treatment, *Sedimentation, Wastewater, Kinetics, Mathematical models, Design, Systems analysis, Equations, Economics, Aeration, Costs. Identifiers: Settling, Thickening.

Engineers involved with the preliminary design of a wastewater treatment system must efficiently evaluate the economic impact of many alternative process schemes. Among the factors to consider when evaluating the completely mixed activated sludge process are the interaction between the aeration tank and the final settler and the effect it has on the total system cost. Optimization of aera-tion and final settling tank sizes requires that proper consideration be given to the thickening function of the final settler. Design graphs are presented to facilitate a rational determination of process unit sizes, accounting for the interaction between aeration and final settling tanks. The graphs for aeration tank performance are based upon mean cell residence time as the main biologi-cal process parameter, while those describing final settler operation incorporate the solids flux concept with the subsidence velocity expressed as a logarithmic function of the solids concentration. In order to aid the engineer in the use of the charts, values of the parameters characterizing microbial growth and sludge settling, as found in the litera-ture for various industrial and municipal wastes, are presented in tabular form. The key feature of the graphs is that they allow consideration of the the graphs is that they allow consideration of the effect of mixed liquor suspended solids concentration upon the sizing of both the aeration chamber and the final settler. Because computational time is reduced to a minimum, the design engineer can quickly arrive at the MLSS concentration that results in the least-cost design. (Bell-Cornell) W76-01005

THE PRAIRIE PLAN, Metropolitan Sanitary District of Greater Chicago,

For primary bibliographic entry see Field 5C.

FARM POLLUTION: HOW REGULATIONS AF-

For primary bibliographic entry see Field 6E. W76-01022

ENVIRONMENTAL, ECONOMIC, AND PHYSICAL CONSIDERATIONS IN LIQUID HANDLING OF DAIRY CATTLE MANURE, New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural

For primary bibliographic entry see Field 5E. W76-01023

FEEDLOT WASTE MANAGEMENT SYSTEMS, For primary bibliographic entry see Field 5E.

W76-01024

AVERT RUNOFF POLLUTION,

W. Waltner, and E. Waltner. Feedlot Management, Vol 15, No 5, p 35-37, May,

1973. 3 fig.

Descriptors: *Runoff, *Feed lots, *Farm wastes, *Irrigation, *Evaporation, *Playas, *Lagoons, *Waste storage, *Waste disposal, Agricultural runoff, Control, Solid wastes, Water pollution, Drainage water.

Identifiers: Pump-out system, Land disposal,

Various evaporation and irrigation systems are used to prevent runoff pollution. Several specific feedlots and their runoff control measures are cited for feeders located in the Southwest. Some feedlot owners direct their feedlot runoff into playas. Others construct lagoons to catch the runoff and to provide a means of irrigation of adjoin-ing land. Others use septic tanks to store the runoff water. The water is then pumped to irrigate adjoining fields. An Oklahoman constructed 2 storage ponds for consecutive storage of the wastewater and ultimate evaporation when it is pumped into shallow evaporation pans. Solids are removed to a storage area for composting. These and other systems constructed to meet individual feedlot problems show that while big feedlots in the southwest states are comparatively 'young', they are mature in grappling with pollution runoff control. (Cameron-East Central Oklahoma State) W76-01025

EXPERIENCE WITH A SPRAY-RUNOFF SYSTEM FOR TREATING BEEF CATTLE FEEDLOT RUNOFF. Kansas State Univ., Manhattan. Dept. of Agricul-

Lural Engineering.
D. E. Eisenhauer, R. I. Lipper, and H. L. Manges.
Presented at 1973 Mid-Central Meeting, American
Society of Agricultural Engineers, St. Joseph, Missouri, April 6-7, 1973, Paper No MC-73-302, 22 p. 2 fig, 11 tab, 6 ref.

Descriptors: *Waste treatment, *Cattle, *Feed lots, *Runoff, Biochemical oxygen demand, Nitrogen, Salinity, Alkalinity, Soil profile, Waste

Identifiers: *Spray-runoff system, *Pollution.

An experimental study was conducted to examine the spray-runoff technique as a possible alternative to disposal practices of beef cattle feedlot runoff. A detailed discussion of the construction of the system and test results are given. While treatment of the feedlot runoff by using the spray-ru-noff system did occur, a satisfactory effluent for direct release to the environment was not produced. Corcentration reductions of BOD5 and Kjeldahl nitrogen were from 40-60 percent under the most favorable conditions. Mass reductions of BOD5 and Kjeldahl nitrogen were as high as 90 percent. Accumulations of salt, sodium and potassium were found in the soil profile after 29 inches of the wastewater had been applied but no serious saline or alkali hazards had developed. (Dudley-East Central Oklahoma State) W76-01026

RUNOFF CONTROL METHOD. For primary bibliographic entry see Field 5E.

AREA NEEDED FOR LAND DISPOSAL OF BEEF AND SWINE WASTES, Iowa State Univ., Ames, North-Central Regional

Extension Project. For primary bibliographic entry see Field 5E. W76-01029 LIQUID MANURE MANAGEMENT FOR

Texas Agricultural Extension Service. College For primary bibliographic entry see Field 5E. W76-01030

EVALUATION OF ANAEROBIC LAGOON TREATING SWINE WASTES, Mississippi State Univ., State College. Dept. of Sanitary Engineering. A. Shindala, and J. H. Scarbrough. Transactions of the ASAE (American Society of

Agricultural Engineers), p 1150-1152, 1972. 4 fig, 2 tab, 3 ref.

Descriptors: *Lagoons, *Anaerobic conditions, *Waste treatment, *Farm wastes, *Hogs, Odor, Waste disposal, Water pollution.

The effectiveness of a single cell anaerobic lagoon in the treatment of swine wastes was investigated.
Compiled data revealed that anaerobic lagoons would provide considerable reduction in the pollutional characteristics of animal wastes. The ef-fluent, however, was still offensive and required further treatment prior to discharge. (Marquard-East Central Oklahoma State) W76-01032

SOME PHYSICAL AND ECONOMIC ASPECTS OF WATER POLLUTION CONTROL FOR CAT-

TLE FEEDLOT RUNOFF, Texas Tech Univ., Lubbock For primary bibliographic entry see Field 5E. W76-01034

SLUDGE DISPOSAL: A CASE OF LIMITED AL-TERNATIVES. Deeds and Data, p D-1--D-4 December, 1971.

Descriptors: *Sludge disposal, *Waste treatment, *Waste disposal, Fertilizers, Irrigation, Soils, Incineration, Lagoons.
Identifiers: Land disposal, Ocean disposal.

A panel discussed alternatives for sludge disposal. A panel discussed alternatives for sludge disposar. Some treatment plants can transport sludge to crop lands. Guidelines can be written for heated anaerobically digested sludge to be applied at rates up to 100 dry tons/acres for any soil type. Cadmium, lead, mercury, copper and chromium in the sludge do not appear to be detrimental to crops. There are also extremely few pathogen problems. Cities like New York, however, don't have available land to dispose of effluent. Other disposal methods are incineration, ocean disposal, and lagooning. Very little survey work cost data has been published on various methods of sludge disposal. It is obvious that much more experimentation and research is needed in order to solve the sludge disposal problem. (Wetherill-East Central Oklahoma State) W76-01035

THEY'RE GETTING THE JUMP ON POLLU-TION CONTROLS,
For primary bibliographic entry see Field 5E.

W76-01036

THE PROBLEM OF FARM ANIMAL WASTE DISPOSAL

Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W76-01037

MANURE WASTE PONDING STUDY, California State Water Resources Control Board, Sacramento.

D. Baier, J. L. Meyer, and D. R. Nielsen. Typescript, n.d., 14 p. 4 fig, 3 tab.

Group 5D—Waste Treatment Processes

Descriptors: *Farm wastes, *Waste storage, *Waste disposal, *Groundwater pollution, *Nitrates, Leakage, Denitrification, Biochemical oxygen demand, Salts, Tensiometers, Seepage Poultry, Soils, Percolation, Salinity control. Identifiers: *Holding ponds, *Manure.

Seventeen manure holding ponds were studied to determine rates at which the ponds sealed against leakage into underlying groundwater, rates of denitrification in the ponds and stratification of chemical constituents and BOD within the ponds. Additionally, the fate of nitrates and other salts were evaluated when field-dried manure was applied as fertilizer. Tensiometric techniques were used to determine hydraulic potential gradients and to obtain samples of the soil solution beneath the ponds. The solutions were analyzed for pH, total dissolved solids (TDS), and nitrates. In addition to the analyses of the soilution, soil samples taken by auger just outside the edge of the ponds from the same depths were analyzed for nitrates abd TDS. Even on coarse textured soils, ponds effectively sealed in 60 days or less. Almost no salt was lost from the ponds, but there was substantial denitrification. Applications of 40 yards of manure per acre resulted in higher nitrates in percolating leachates and slightly higher salinity than applications of 12 yards of manure per acre. (Cameron-East Central Oklahoma State)

BIOLOGICAL TREATMENT OF FEEDLOT RUNOFF FOLLOWING SETTLING,

Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering. T. J. McGhee.

Presented at the 66th Annual Meeting, American Society of Agricultural Engineers, University of Kentucky, Lexington, June 17-20, 1973; Paper No. 73-413, 19 p. 12 fig. 1 tab, 13 ref.

Descriptors: *Feed lots, *Farm wastes, *Runoff, *Waste treatment, *Biological treatment, Activated sludge, Design, Costs, Chemical oxygen demand, Effluents, *Agricultural runoff. Identifiers: Settling.

An activated sludge system designed for the treatment of settled feedlot runoff has been studied both in the laboratory and in the field. Initial studies utilizing the gravity solids return system demonstrated that reductions in COD of approximately 60% were attainable at liquid retention times of 4 days or more. From the data obtained in the laboratory study, it was concluded that the field system should be designed to operate at a liquid retention time of two days or more and at an organic loading rate of less than 1.0 lb. COD per lb. MLSS per day. Calculations based upon the average annual runoff from the lots and of the annual rates of precipitation and evaporation in eastern Nebraska indicated that the required volume would be 890 gallons assuming that operation would be possible for 180 days per year. The cost of effectively treating settled feedlot runoff with an aerobic biological system has been estimated to \$0.65 per head for the climatic conditions of eastern Nebraska. This cost is dependent upon animal density, climate, and the balance between holding pond and treatment unit size. (Cartmell-East Central Oklahoma State)

MODELS FOR HANDLING SOLID MANURE, For primary bibliographic entry see Field 5E. W76-01043

COSTS NOTED FOR SOLID AND LIQUID WASTE SYSTEM.
Feedlot Management, Vol 15, p 58, January, 1973.

Descriptors: *Waste storage, *Waste disposal, *Liquid waste, *Farm wastes, *Costs, *Solid wastes, Settling basins, Lagoons, Irrigation, Legal aspects, Missouri

Identifiers: *Manure, *Land disposal.

An animal waste disposal system was developed that meets Missouri law with respect to keeping waters of the state clean. Basically, the system involves returning waste solids and liquids to agricultural land and preventing them from getting into water resources. The liquids are drained off into a lagoon; the solids settle out in the settling basin. Solids are deposited on the land by using a conventional manure spreader. The liquids are spread through irrigation equipment. The annual costs to own and operate the system range from a low of \$0.75 per head for a 400-head operation using the hand carry system to a high of \$1.37 per head for a 1,200 head operation using the traveling gun system. (Cartmell-East Central Oklahoma State)

DESIGN OF LONG INTERCEPTOR SEWERS, Edinburgh City Engineer's Dept. (Scotland). A. W. Blakey, G. F. McCreath, and M. G. D. Thomson.

Journal of the Institution of Municipal Engineers, Vol 99, No 12, p 388-343, December, 1972. 4 fig, 3 tab. 6 ref.

Descriptors: *Sewers, *Sewerage, Rainfall intensity, Computers, Hydrographs, Interceptor sewers.
Identifiers: Storm profiles.

method of designing long interceptor sewers taking into account rainfall characteristics in as-sessing their flow-carrying capacity is described. The design procedure proposed involves examination of the effect of undulating storm profiles associated with prolonged nearly-continuous rainfall of moderate intensity as alternatives to the Bil-ham/Holland type of storm profile with its single peak of high rainfall intensities of relatively short duration. The use of a computer is essential due to the large number of calculations involved with a printout obtainable for each hydrograph with peak values reduced to simulate the effect of storm overflow devices. The final hydrograph printouts can be stored for use as input hydrographs on a final computer run for the sizing of the interceptor sewer using a sub-area technique. Alternatively, the input data file can be prepared to include all existing trunk sewer systems with the new interceptor sewer system and to specify maximum rate of flow values at overflow positions. This avoids the necessity for individual trunk sewer designs for each different storm profile used. (Sandoski-W76-01047

SEWER IN FLOOD PLAIN MUST FIGHT INFILTRATION.

Public Works, Vol 104, No 1, p 66-67, January, 1973. 2 fig.

Descriptors: *Plastic pipes, *Sewers, Flood plains, Missouri River, Infiltration, Flow rates, Installation, Pipes.
Identifiers: *Flextran.

The development of a 1300-acre balanced urban community built along the Missouri River resulted in high flow rate and tight infiltration specifications for the sewer line installed beneath the flood plains. Flextran, a new fiber glass reinforced polyester resin pipe made by Johns-Manville, was used for the sewer line. This flexible conduit is composed of polyester resin and siliceous sand, reinforced with continuous roving glass fibers, is completely non-metallic, and avoids electrolytic or galvanic corrosion. An isophthalic polyester resin gives the pipe its resilience, resistance to moisture, and high dimensional stability. This sand is a functional low-cost filler for wall thickness to meet the internal and external pipe requirements used in gravity transmission of water and waste water. By using Flextran, with its high flow rate, a reduction

in sewer line slope as well as the number of pumping stations was accomplished. Installation was fast and trouble-free due to Flextran's lightweight and longer segment lengths. (Sandoski-FIRL) W76-01048

SYNCHRONIZED TEAM HANDLES HEAVYWEIGHT SEWER PIPE COMBINATIONS,

TIONS, Construction Methods and Equipment, Vol. 54, No. 12, p 40-42, December, 1972. 8 fig.

Descriptors: *Sewers, *Construction, Construction equipment, Soils, Timber piles, Trenches, Installation, Pipelines, Pipes.

A \$22.8 million sewer outfall laying job including installations of 16,250 feet of pipe with precast caps and cradles, 11,000 feet of H-pilings, and 137,000 feet of timber piling has been performed along Long Island. Trenching the line removed atong Long Island. Irename the reinverse two million yards of sand, silt, and bog material resulting in a 25-foot wide base, 4 to 6 feet below pile cutoff. Dredging and pile driving started from the center permitting a constant shore feed of materials out to the pile and pile barges as well as backfilling in the most effective sequences. The 400 x 40-foot pipelaying barge, stabilized for extra heavy lifting and lowering by external ballast tanks and water-filled compartments within its hull, houses two 60-foot independently operated derrick booms. These booms, mounted on a structural steel base that travels on rails the length of the barge, are equipped with 16-part 1.25-inch lifting cables and powered by a four-drum skagitt hoist-ing engine. Assembled 100-foot pipe strings are barged alongside the twin derricks, lowered into the trench, and bolted to the preceeding string. Timber piles supporting the pipe strings are driven in the trench by two cranes working from a 340 x 40-foot modified carfloat in an area 260 feet long. To insure accuracy of specifications requiring pipe joints to fall four feet from the center-line of each pile bent, 5-, 6-, and 8-pile bents are positioned with three templates. (Sandoski-FIRL) W76-01049

INSERTION OF POLYETHYLENE PIPE RENEWS DAMAGED SEWER,

Montgomery Water and Sanitary Sewer Board, Ala.

For primary bibliographic entry see Field 8A. W76-01050

HOW TORONTO IS INSTALLING SEWERS WITHOUT DISTRUPTING TRAFFIC FLOW, L. Webster.

Engineering and Contract Record, Vol. 85, No. 12, p 56-57, December, 1972. 3 fig.

Descriptors: *Storm drains, *Sewers, Tunnels, Pipes, Excavation, Installation.
Identifiers: Toronto, Canada, Coring system.

Use of a new coring system has enabled Toronto road authorities to install 2.6 miles of 12- to 48-inch storm sewer lines under existing roadways without disruption to traffic or the existing road surface. The coring system centers around a hydraulic ram and a series of specially developed cutting heads. Technique for coring a service line involves sinking a shaft at the end of the line (no more than 125 feet apart) and excavating to the necessary working depth below the grade of the service. Drill rods are slowly pushed towards the target excavation; expanders widen the hole compressing the soil around the perimeter and preventing collapse; and, subsequent passes are made with a coring tool that cuts the selected diameter shaft, compressing the walls of the tunnel and passing the spoil through the center. Once the fulldiameter shaft is completed, the same coring tool is used to insert the lengths of pipe. Gor this, the sections of pipe are fed to the target excavation and inserted in the hole spigot-end first. An attachment on the

drilling tool is used to pull the pipe sections back into the shaft. As each bell end is about to enter the shaft, another pipe section is permanently joined to it and the combined sections are again pulled in. This process is repeated until the pipe reaches the original excavation. (Sandoski-FIRL) W76-01051

A SYSTEMATIC AND THEORETICAL STUDY OF SEWERAGE REMODELLING PLANS, I. RIVER TURBIDITY CONTROL AND THE ADJUSTMENT OF CROSSSECTIONS (GESUIDO SEIBI KEIKAKU NI KANSURU SHISUTEMURONTEKI KENKYU I. TOKU NI KASEN ODAKU SEIGYO TO MEN SEIBI NI TSUITE),

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ODARU SEIG TO TO MEN SEIBT IN 1SUITE), Y. Daimon, T. Tsutsumi, and M. Nakamura. Preprint, 9th Conference on Sanitary Engineering, January 29-30, 1973, Sendai, Japan. (Japanese Society of Civil Engineering, Committee on Sani-tary Engineering), p 48-55. 13 fig, 6 ref.

Descriptors: *Model studies, *Sewerage, *Rivers, Turbidity, Load distribution. Identifiers: Remodeling.

Studies on sewerage system remodeling plans examine the local load distribution subsystem from the standpoint of river turbidity and the sewerage cross section readjustment. Viewing a sewerage cross section at a given time shows the turbidity of the river and offers data for point investment and line investment. Indexes between two points of a model are considered in order to obtain the time progress of local load distribution. Model formulation which entails a system model and a cut, an equation of state, operating variables, control con-ditions, and evaluation functions is detailed. This model is applicable not only to a basin with a straight river, but also for basins containing paral-leling or ramified river systems. (Sandoski-FIRL) W76-01055

THE SEWAGE SLUDGE + RUBBISH + CINDERS EQUATION SOLVED AT THE NEW
URBAN WASTE TREATMENT PLANT IN
DIEPPE (L'EQUATION BOUES D'EGOUT +
ORDURES + MACHEFER EST RESOLE DANS
LES NOUVELLES INSTALLATIONS DE
TRAITEMENT DES DECHETS URBAIN
DEALISFES A DETIDEN REALISEES A DEIPPE),

A. Marchand. Techniques et Sciences Municipales, Vol 67, No 10, p 381-391, October, 1972. 4 fig.

Descriptors: *Waste water treatment, *Treatment facilities, Incineration, Aeration, Effluents, Chlorination, Sludge, Rivers, Municipal wastes. Identifiers: Dieppe, France, Secondary decantation, Sludge thickening.

A combined municipal waste incineration and waste water treatment plant in Dieppe, France, includes a waste water treatment unit with a capacito of 8000 cu m/day and an average BOD5 content of 250 mg/liter. The purification efficiency of the 815 cu m aeration tank for primary decantation is 81 percent. The effluent from the aeration tank is discharged into a river before secondary decanta-tion and chlorination. The sludge is gradually hickened to 94 percent in the digester kept at a temperature of 29-35 C, and further to 91 percent water content in a thickener. After the water conwater content in a thickener. After the water content is reduced to 40-45 percent by drying with steam from the waste incineration plant, the dehydrated sludge is sent to the incinerator. The gases escaping from the sludge during treatment operations are stored for admission into the waste incinerator. (Sandoski-FIRL) W76-01056

SYSTEM FOR REGULATION OF COMBINED

SEWAGE FLOWS, C. V. Gibbs, S. M. Alexander, and C. P. Leiser. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No

trol, *Sewers, Monitoring, Computers, Flow con-

Identifiers: Seattle, Washington, Computer Augmented Treatment and Disposal(CATAD).

As an alternative to the construction of separate drainage systems, the use of storage in trunk and interceptor sewers for regulation of combined sewage flow within the capacity of the interceptor is proposed. The computer-directed system, known as Computer Augmented Treatment and Disposal (CATAD), represents a procedure for maximum utilization of available storage in trunk and interceptor sewers to reduce or completely eliminate overflow. The CATAD system controls comprise a computer-based central facility for au-tomatic control of remote regulator and pumping stations in Seattle, Washington. The installation of equipment at the central station and at 32 remote stations was completed in 1971. All required pro-gramming for data acquisition, central station con-sole operation, satellite terminal operation, supervisory commanding, events recording, and data logging is now complete. The system is in continuous operation for system monitoring and is being tested for control in a supervisory mode. Routines for automatic control have been substantially completed and are being integrated systematically with other functions. (Sandoski-FIRL) W76-01057

CENTRALIZED CONTROL SYSTEM OF SEWERAGE (GESUIDO SHUCHU SEIGYO SHISUTEMU),

T. Ohto, S. Nogita, H. Iwaki, S. Mori, and T.

Hitachi Hyoron, Vol 54, No 10, p 919-923, October, 1972. 9 fig, 1 tab, 7 ref.

Descriptors: *Waste water treatment, *Sewerage, Storm runoff, Drainage practices, Sewage treatment, Activated sludge, Biochemical oxygen demand, Rainfall-runoff relationships, Water quality, Infiltration. Identifiers: Japan, Toxic materials.

In the past, Japanese sewerage water drainage practices were based primarily on a combined sewage and storm water runoff system. More recently, installation of divided drainage is promoted with secondary sewage treatment being performed by activated sludge, which is not less costly but whose result and activity are dependent on biochemical reactions. The biochemical oxygen demand capacity fluctuates largely due to rainfallrunoff relationships though seasonal differences should be considered as well as the change of water quality by rain and toxic material infiltra-tion. In the activated sludge process, the biological phase is complex, and the sludge recycling system further complicates the behavior of the sludge. The structure of a process simulator, the unit calculation program, and a centralized sewage and monitoring and control system are presented. The centralized control system has a capacity for security control, optimum control, and a manmachine communication. (Sandoski-FIRL) W76-01058

TOWARDS RATIONAL DRAINAGE DESIGN, For primary bibliographic entry see Field 4A. W76-01061

PVC PIPE CUTS COLORADO DISTRICT'S FLOW COST, North Table Mountain Water and Sanitation Dis-

trict, Colo. For primary bibliographic entry see Field 8G. W76-01063

SA 6, p 951-972, December, 1972. 9 fig, 3 tab, 6 DESIGN AND OPERATION OF A FEEDLOT RUNOFF TREATMENT SYSTEM, University of Nebraska, Lincoln Department of Civil Engineering.

D. S. Backer.

MS Thesis, 1973, 46 p. 10 fig. 9 tab, 34 ref.

Descriptors: *Waste water treatment, *Runoff, *Feed lots, *Design, Operation and maintenance, Equipment, Costs, Automation, Odor, Aeration, Chemical oxygen demand, Suspended solids, Effluent, Hydrogen ion concentration, Analysis,

This study dealt with the design, start up, and operation of a pilot plant built to treat feedlot runoff. The plant's purpose was to provide a system which was substantially automatic and economical in operation. The plant was evaluated for simplici-ty of construction, ease of operation and main-tenance, cost of operation, effectiveness of treattenance, cost of operation, effectiveness of treat-ment, and comparability to the laboratory unit. The design of the pilot plant was based on an aero-bic unit that featured an air lift pump to return solids to the aeration chamber. Laboratory analyses were run on pH, chemical oxygen de-mand, and suspended solids. COD and suspended solids removals increased with increased detention time. The unit operated in the pH range 6.5-8.5. The net cost per animal was approximately \$.60 for the experimental system. The field unit was easy to construct, required very little maintenance and was simple to operate. (Cartmell-East Central Oklahoma State) W76-01088

BASIC PERFORMANCE PARAMETERS FOR OXYGENATION AND LIQUID CIRCULATION IN ROTOR-AERATED LIQUID WASTE

IN ROTOR-AERATED ELECTRICAL SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
G. L. Nelson, J. J. Kolega, U. Agena, Q. Graves,

G. L. Nelson, J. J. Rolega, O. Agena, A. Gardan, and G. Hoffman.

Presented at 1968 Winter Meeting, American Society of Agricultural Engineers, Chicago, Ilinois, Dec 10-13, 1968, American Society of Agricultural Engineers, St. Joseph, Michigan.

Paper No 68-932, 41 p, 15 fig, 5 tab, 17 ref.

Descriptors: *Rotors, *Performance, *Liquid wastes, Equations, Livestock, Farm wastes, Waste water treatment.

Identifiers: Rotor-aerated tank, Oxygen transfer, Liquid circulation.

A study was made of performance characteristics of rotor-aerated ditch or tank systems for livestock wastes. The purpose was to: (1) identify the physical parameters that characterize oxygen transfer and liquid circulation effects in a rotor-aerated liquid waste system; and (2) based on these parameters, to develop prediction equations for oxygen transfer and for liquid circulation effects for one class of rotors. The study included experiments with two laboratory models, one each experiments with two laboratory models, one each for oxygenation and liquid circulation. Conclusions include: (1) For a class of rotors, the dimensionless oxygen transfer parameter can be pre-dicted for system design and operating purposes, (2) the oxygen transfer coefficients, km, of two geometrically similar rotors are directly propor-tional to the ratios of the products. (3) liquid velocity for rotor-driven circulation in a ditch can be estimated, (4) the ratio of channel length to width is non-critical in the range 5.8 to 10.0, and (5) the rotor Froude number is critical below a value of 0.15 for liquid circulation effects in a rotor-driven ditch. (Camerob-East Central Oklahoma State) W76-01092

THESE STOCKYARDS' SOLUTIONS COULD WORK FOR YOU.
Feedlot Management, Vol 15, No 5, p 48-52, May,

1973, 3 fig.

Group 5D—Waste Treatment Processes

Descriptors: *Livestock, *Farm wastes, *Feed lots, *Management, Waste treatment, Waste disposal, Lagoons, Incineration. Identifiers: *Stockyards.

A tour of several livestock markets turned up a number of methods for successfully handling livestock wastes. These techniques might be adaptable to feedlot operations. Features that will make waste removal faster and more efficient include a flow-through alley system, new concrete floors to replace brick floors, and steel pens instead of wooden ones. Most large markets are successfully meeting the challenge of controlling pollution. Major remodeling programs, and such new concepts as lagoon systems, disposal districts, and incinerators require large financial expenditures. (Cartmell-East Central Oklahoma State)

FARMLAND FARM STRESSES NO RUNOFF, LATEST TEST RESULTS.

Feedstuffs, Vol 46, No 50, p 13, December 9, 1974.6 fig.

Descriptors: *Agricultural runoff, *Livestock, *Experimental farms, Research and development, Ditches

Identifiers: Oxidation ditches, Waste handling.

At Farmland Industries new research and demonstration farm, there is no runoff of livestock wastes into nearby ditches or creeks. Located at Piper City, Kansas, the farm is fully self-contained. Oxidation ditches and aerobic bacteria solve the manure handling problems in the swine, poultry and dairy units. The research farm includes a swine unit, consisting of farrowing house, nursery, finishing house and gestation barn. The poultry unit has a capacity of 4,400 layer hens in two houses. It is environmentally controlled and the cages are over an oxidation ditch. The beef cattle unit has a 300-head capacity. The 20 pens of cattle also serve as test groups of feed formulations or comparisons of competitive brands. Other facilities on the farm include a feed mill, a stable for 6 horses, a show arena, a necropsy unit with laboratory and post-mortem facilities, and a waste research facility for studying new and improved methods of animal waste disposal. The work at Farmland is closely coordinated to make test results most meaningful to co-op members in their own farming and ranching. (Cameron-East Central Oklahoma State) W76-01094

REMOVAL OF PHOSPHATES AND METALS FROM SEWAGE SLUDGES,

Waterloo Univ. (Ontario). Dept. of Chemical En-

gineering. D. S. Scott, and H. Horlings.

No 9, p 849-855, September, 1975. 5 fig, 7 tab, 11 ref.

Descriptors: *Heavy metals, *Iron, *Aluminum, *Zinc, *Pollutants, Sewage treatment, Sewage sludge, Phosphates, Chemical precipitation, Separation techniques, Hydrogen ion concentration, Acid-base equilibrium, Reclamation, Recycling, Solubility, *Sludge treatment, Waste water treatment, Sludge.

Identifiers: *Metal extraction, Fractionation, Selective precipitation.

The sludges produced from wastewater treatment plants contain most of the phosphate and metallications present in the water being treated. A technique is presented to remove these materials from the sludge with a high yield so that crude metal-phosphate products can be recovered and recycled. Iron, aluminum, zinc, and phosphate are the major elements recovered. Anaerobic sludge underflow and a filter cake produced from an anaerobic sludge were extracted in an acid mixture and the extract filtered. Metal ion and phosphate

ion precipitation was carried out by slow addition of either a sodium hydroxide or a calcium hydroxide solution, with continuous stirring and monitoring of the pH. Graphs show the degree of extraction of metals and phosphate under various acid conditions and their sequence of precipitation as the extract pH is adjusted. (Davis-Vanderbilt) W76-01100

FATE OF TRACE METALS IN LOS ANGELES COUNTY WASTEWATER DISCHARGE, Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics; and Massachusetts Inst. of

Hydrodynamics; and Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. For primary bibliographic entry see Field 5B. W76-01104

REMOVAL OF DISSOLVED MOLYBDENUM FROM WASTEWATERS BY PRECIPITATES OF FERRIC IRON,

Colorado Univ., Boulder. Dept. of Geological Sciences. G. R. LeGendre, and D. D. Rennells.

Environmental Science and Technology, Vol 9, No 8, p 744-749, August, 1975, 6 fig, 2 tab, 35 ref.

Descriptors: "Heavy metals, "Iron, "Iron compounds, "Molybdenum, "Chemical precipitation, "Waste water treatment, Adsorption, Mine water, Iron oxides, Toxicity, Effluents, Sediments, Hydrogen ion concentration, Streams, Spectrophotometry, Filtration, Colorado.

Hydrogen ion concentration, Streams, Spectrophotometry, Filtration, Colorado. Identifiers: *Floculant hydroxides, *Climax molybdenum mine, *Atomic absorption, *Open pit copper mines, Uranium mills, Clear creek, Ten mile creek(Colo).

A method was developed to remove dissolved molybdenum from aqueous effluents. In the presence of ferric hydroxide at a low pH, more than 95% of total dissolved molybdenum was removed from each of three mill waters tested. The ratio of dissolved ferric iron to dissolved molybdenum must exceed about 10:1 for best results. Under these conditions adsorption or coprecipitation occurs, althrough the exact mechanism is not completely understood. A field example is given, taking place in a stream in Colorado that receives dissolved molybdenum from a mining and milling operation. Filtration stu-dies using a 0.01-micron filter show that molybdenum cannot be removed by filtration unless it has first been precipitated as described above. Graphs and tables show removal of molybdenum as a function of pH and amount of ferric iron present. Molybdenum was measured using a modified colorimetric thiocyanate procedure. Iron was measured by atomic absorption. (Davis-Vanderhilt) W76-01106

FLOATATION AERATOR FOR AERATING AND MOVING WATER,

R. A. Cramer, Jr. U. S. Patent No 3,865,909, 5 p. 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 931, No 2, p 859, February 11, 1975.

Descriptors: *Patents, *Waste water treatment, Aeration, *Water pollution control, *Pollution abatement, Equipment, Oxygenation, Diffusion, Dispersion.

Identifiers: Submersible motors.

A water moving apparatus which also aerates water includes a float member floating on a body of water and tethered in a selected position. A submersible motor is supported by the float and is suspended by the float in the water. It has a propeller that operates to propel water upward through an opening in the float. A diffusing or dispersing member is mounted above water level on the float coaxial with the propeller and opening whereby operation of the motor and propeller

directs water against the diffuser to effect an upward and outward discharge of water resulting in aeration of the water. (Sinha-OEIS) W76-01129

WASTE WATER TREATMENT PROCESS,

Du Pont de Nemours (E. I.) and Co., Wilmington, Del. (assignee).
D. G. Hutton, and F. L. Robertaccio.

D. G. Hutton, and F. L. Robertaccio. U. S. Patent No 3,904,518, 8 p, 1 fig, 9 tab, 12 ref; Official Gazette of the United States Patent Office, Vol 938, No 2, p 766, September 9, 1975.

Descriptors: *Patents, *Waste water treatment, *Water quality control, *Water pollution control, *Biological treatment, *Oxidation, Industrial wastes, Domestic wastes, Activated carbon, Hydrogen in concentration.
Identifiers: Fuller's earth.

An improvement in the process of continuously purifuing waste water is described. It is comprised of the following steps: contacting in a treatment zone a mixture of waste water which has a pH of between about 4 and 11 and which optionally has been subjected to primary treatment to remove solids, and biologically active solids in an amount sufficient to provide a total suspended solids content of the mixture of between about 10 and 50,000 parts per million; mixing a gas containing molecular oxygen through the mixture; and removing the mixture from the treatment zone. The improvement consists of adding to the mixture between about 50 and 1500 parts of activated carbon or between about 250 and 2500 parts of adsorptive fuller's earth per million parts of feed waste water. The carbon or fuller's earth should have a surface area of at least 100 square meters per gram and a particle size such that it will pass through a 200 mesh per inch sieve. (Sinha-OEIS)

METHOD AND APPARATUS FOR PURIFICA-

K. Stopka

U.S. Patent No 3,904,521, 8 p. 15 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 938, No 2, p 766-767, September 9, 1975.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution control, *Water quality control, *Industrial wastes, *Sewage treatment, *Oxidation, Ozone, Flotation. Identifiers: Cyanide.

A method and apparatus are described which utilize an ozone containing atmosphere for the oxida-tion of waste materials. The water containing waste is propelled in a chamber in the form of small droplets into an ozone containing atmosphere with at least some of the droplets hitting the walls of the chamber. The droplets which hit the chamber walls form a thin film on the walls and run down to the body of water. The droplet size should be such that a majority of the droplets will not remain suspended in the atmosphere to form a humid atmosphere but will fall back to the body of water so that purified water is returning continuously to the body of water. A suitable range of droplet size is from about 5 to about 50 microns. This preconditioned liquid is picked up and exposed to a fresh ozone atmosphere in a secondary and subsequent chamber arranged in series. The number of succeeding chambers depends on the degree of contamination of the liquid. In another aspect of the invention a method and apparatus referred to as an electric coagulator is provided for continuously removing matter from water by flotation. The water containing suspended matter is subjected to electrolysis, thereby producing hydrogen bubbles, which ascend to the surface of the water carrying the suspended matter where it can be removed. (Sinha-OEIS) W76-01135

RADIATION TREATMENT METHOD AND AP-PARATUS FOR DECONTAMINATION OF POL-LUTED FLUID, Energy Systems, Inc., New York. (assignee). N. Lund, K. J. Bialy, L. A. Mann, and D. D.

Woodbridge.

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U. S. Patent No 3,904,882, 4 p, 3 fig, 6 ref; Official
Gazette of the United States Patent Office, Vol
938, No 2, p 866-967, September 9, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution control, *Water quality control, *Radiation, *Disinfection, Gamma rays, Effluents, Liquid wastes, Septic

A radiation treatment method and apparatus are disclosed for the safe disinfection and decontamination of liquid waste, such as sewage. Liquid waste is processed by removing some solids from the effluent, irradiating the effluent less some solids with a gamma radiation field and percolating the disinfected effluent, or discharging the disinfected diquid into sewage conduits or into streams or other bodies of water. The disinfecting chamber is a box constructed of concrete or other compatible material having a radiation shidding cover. ble material, having a radiation shielding cover, and having an inlet at one end and an exit at the other end. Baffles located in the box produce desired distribution and turbulence of flow. Sources of ionizing radiation, usually gamma radiation, are placed in the chamber in such a manner as to provide a relatively uniform radiation field in the effluent passing through the system. (Sinha-OEIS) W76-01136

METHOD AND APPARATUS FOR PURIFYING WASTE WATER,

T. Minegishi. U.S. Patent No 3,905,890, 5 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 938, No 3, p 1230, September 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water purification, *Water quality control, *Water pollution control, *Electrolysis, *Flocculation, Coagulation, Electrodes, Separation techniques.

A method of purifying waste water comprises out an electrolysis of water in a defined area of a vessel in order to form oxygen and hydrogen. A flow of waste water is directed into the electrolysis area to subject it to the influence of the newly formed oxygen and hydrogen to cause promotion of nuclei formation. This causes a bonding coagulation of the waste material around the nuclei. Included is a vessel having an inner wall with an overflow for the water and for flocculated waste which is directed into a separating chamber for the removal of the solid waste material. The vessel includes a central tubular conduit having spaced electrodes which are subjected to a DC potential in order to produce electrolysis. After coagulation the waste material and remaining liquid are discharged into the liquid of the vessel and permitted to float to the top which includes an overflow portion for the separation of the purified liquid from the flocculated material. The vessel includes a filter at its bottom for the passage of filtered liquid. (Sinha-OFIS) W76-01137

METHOD OF WASTEWATER TREATMENT, Autotrol Corp., Milwaukee, Wis. (assignee).

Autorio Corp., B. Brander W. N. Torpey. U. S. Patent No 3,905,899, 4 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 938, No 3, p 1233, September 16, 1975.

Descriptors: *Patents, *Wastewater treatment, *Sewage treatment, *Water pollution treatment, *Water pollution control, *Biological treatment, Separation techniques, Settling basins, Biodegradation, Equipment.

An improved wastewater treatment tank employs a biological treatment zone, including rotating biological contactors in its upper portion and a set-tling zone for solid materials sloughed off the con-tactors and present in the wastewater in its lower portion. The settling zone is beneath the biological contactors and is physically separated from the biological treatment zone by a longitudinal baffle with forms a 'false bottom' for the biological treatment zone. The longitudinal baffle extends the full width of the tank. Wastewater entering the the full width of the tank. Wastewater entering the treatment tank is forced through the biological treatment zone aided by the pumping effect of the rotating contactors. Rotating the contactors results in carrying forward any solids settled out of the wastewater in the biological treatment zone, thereby preventing solid buildup. (Sinha-OEIS) W76-01138

EXPERIMENTAL EUTROPHICATION OF TER-FIRST ANNUAL REPORT OF THE UPLAND RECHARGE PROJECT, Brookhaven National Lab., Upton, N. Y. Biology

Dept. G. M. Woodwell, J. Ballard, M. Small, E. V.

Pecan, and J. Clinton. Report BNL 50420 (Biology and Medicine--TID-4500). February 1974. 29 p, 17 fig, 11 tab, 10 ref, 3 append. AEC AT(30-1)16.

Descriptors: *Sewage treatment, *Vegetation, *Nutrient removal, Recharge, New York, Marshes, Ponds, Water reuse, Observation wells, Agriculture, Grasslands, Nutrients, Groundwater,

Forests, Irrigation.
Identifiers: *Brookhaven(N.Y.), Nutrie recycling, Terrestrial systems, Aquatic systems.

The alternatives to dumping nutrient-laden fresh-water into coastal oceans by using natural or man-made ecosystems dominated by higher plants to reclaim water and trap nutrients in forms that may provide recycling loops to civilization were exploved. Groundwater quality in the experimental test plots varied and was correlated with vegeta-tion. The highest quality was associated with undisturbed forest. Nitrogen and calcium concen-trations tended to be high under agricultural fields, lower under old fields and pine forests, and lowest under late successional oak-pine forests. After sewage was applied to those ecosystems for six months, through fall and winter, iron and phosphorus were totally absorbed in the biota and soil and sulfur and magnesium were partially ab-sorbed. The absorption capacity of potassium and calcium was progressively reduced and sodium and chloride were not absorbed. Nitrate nitrogen rose from September-December in percolate of oak-pine forest treated with primary effluent, but reached a maximum on November 1 in the forest treated with secondary effluent. In aquatic systems, meadows functioned effectively during winter to reduce sewage organic content and specific conductance. Behavior of these systems specific conductance. Behavior of these systems through the year were to be investigated in the spring and summer of 1974. Combined aquatic and terrestrial systems will probably be most effective. (Buchanan-Davidson--Wisconsin) W76-01155

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR NEW SOURCES. BEET SUGAR PROCESSING SUBCATEGORY OF THE SUGAR PROCESSING POINT SOURCE CATEGORY

CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G. W76-01204

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE MAJOR INORGANIC PRODUCTS SEG-MENT OF THE INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGO-

RY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

E. E. Martin.

E. E. Martin. Avialable from the National Technical Informa-tion Service, Springfield, Va 22161, as PB-238 611, 10.50 in paper copy, \$2.25 in microfiche. EPA Re-port 440/1-74-077-a, March, 1974. 369 p, 83 fig, 85 ref, 78 tab. 68-01-1513.

Descriptors: "Chemical industry, "Waste water treatment, "Inorganic compounds, "Water quality standards, Water pollution control, Industrial wastes, Wastes, Water pollution sources, Calcium chloride, Chlorine, Calcium hydroxide, Potassium, Sodium chloride, Sodium hydroxide, Sodium sulfate, Water quality, Standards, Ecnomics, Chemicals, Effuents, Regulation, Sulfur compounds, Calcium compounds, Sodium compounds, Potassium compounds.

pounds, Potassium compounds.
Identifiers: Aluminum chloride, Aluminum
sulfate, Calcium carbide, Hydrochloric acid,
Hydrofluoric acid, Calcium oxide, Potassium
chromate, Potassium hydroxide, Potassium
sulfate, Sodium carbonate, Sodium silicate, Sulfuric acid, Titanium dioxide, Aluminum com-

An extensive study of the inorganic chemicals An extensive study of the inorganic chemicals manufacturing industry led to the development of effluent limitation guidelines and standards. The effluent limitation guidelines presented set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the degree of effluent reduction attainable through the application of the best available technology economically achievable. The guidelines cover effluents produced during the manufacture of aluminum sulfate, calcium carbide, calciproduced during the manufacture of aluminum chloride, aluminum sulfate, calcium carbide, calcium chloride, chlorine, hydrochloric acid, hydrogen peroxide, hydrofluoric acid, calcium oxide and calcium hydroxide, nitric acid, potassium chromates, potassium hydroxide, potassium betal, potassium sulfate, sodium bicarbonate, sodium dichromate, sodium hydroxide, sodium metal, sodium silicate, sodium hydroxide, sodium sulfate, sulfric acid, and titanium dioxide. Based on the application of the best practicable technology currently available, 12 of the chemicals can be manufactured with no discharge of waste water pollutants while 20 of the chemicals can be manufactured without discharge of pollutants through pollutants while 20 of the enemicals can be manufactured without discharge of pollutants through application of the best available technology economically achievable. Supporting data and rationale for development of the effluent limitation guidelines and standards of performance are discussed. Chemical manufacturing processes, wastes, and waste treatment processes and costs are described. (Witt-IPC) W76-01205

DEVELOPMENT DOCUMENT FOR EFFLUENT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE RED MEAT PROCESSING SEGMENTS OF THE MEAT PRODUCTS AND RENDERING PROCESSING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington, D. C. Efficate Children Directory

D.C. Effluent Guidelines Div.

I D Denit

Available from the National Technical Informa-Tion Service, Springfield, Va 22161, as PB-238 836, \$7.50 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-012-a, February, 1974. 188 p, 25 fig, 47 ref, 18 tab. 68-01-0593.

Descriptors: *Food processing industry, Waste water treatment, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water pollution water pollution control, Water quality control, Waste treatment, Costs, Operating costs, Capital

Group 5D-Waste Treatment Processes

costs, Recirculated water, Recycling, Separation techniques, Filtration, Aeration, Biological treatment, Regulation.

dentifiers: *Meat packing industry,

*Slaughterhouse wastes, Packaging.

The results of an extensive study of the meat packing industry for the purpose of developing ef-fluent limitation guidelines and standards for the tiuent limitation guidelines and standards for the industry are presented. Only red meat slaughter-houses (packinghouses) were included in this study. Plants that only process meat but do no onsite slaughtering, rendering operations carried out off the site of the packing plant, and all poultry (white meat) processing plants were not included. Effluent guidelines are set forth for the degree of effluent reduction attainable through the applica-tion of the best practicable control technology currently available, and the best avialable technology economically achievable, which must be achieved by July 1, 1977, and July 1, 1983, respectively. The proposed recommendations require the best biological treatment technology currently availa-ble for discharge into navigable water bodies by 1977. The technology is represented by anaerobic plus aerated plus aerobic lagoons with efficient solid-liquid separation, or their equivalent. The recommendation for 1983 calls for the best biological, chemical and/or physical treatment and in-plant controls. In this instance, efficient biological treatment is complemented by water conservation practices, improved nutrient removal, and water filtration. When suitable land is avialable, land disposal may be an economical option to eliminate any direct direct discharge. Recycle or reuse of ef-fluents in the plant is another alternative. Processes, wastes, and waste treatment processes and their costs are discussed. (Witt-IPC)

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE MILLS POINT SOURCE CATEGORY, Enivronmental Protection Agency, Washington,

D.C. Effluent Guidelines Div.

J. D. Gallup.

fibers

Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 832, 88.00 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-022-a, June, 1974. 255 p, 20 fig, 216 ref, 31 tab. 68-01-1515.

Descriptors: *Industrial wastes, *Waste water treatment, *Textiles, *Water quality standards, Water pollution treatment, Wastes, Water pollution sources, Water pollution, Water pollution control, Water quality control, Waste treatment, Costs, Operating costs, Capital costs, Cotton, Suspended solids, Effluents, Filtration, Biological treatment, Coagulation, Regulation.

Identifiers: *Textile industry, Wool, Synthetic

The findings of a study of the textile industry for The findings of a study of the textile industry for the purpose of developing waste water effluent limitations cover cotton, wool, and synthetic fabric and fiber finishing. Effluent limitation guidelines are set forth for the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the best available technology economically achievable. The proposed regulations require in-plant waste management and tions require in-plant waste management and operating methods, together with the best secondary biological treatment technology currently available for discharge into navigable water bodies. This technology is represented by preliminary screening, primary treatment (wool scouring only), coagulation (carpet mills only), and secondary biological treatment. In addition, multimedia filtration or its equivalent for the control of total suspended solids is recommended for new plants. Supporting data and rationale for development of the proposed effluent guidelines and standards are included. Processing techniques, wastes, and waste treatment processes and costs are discussed. (Witt-IPC) W76-01207

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NI SOURCE PERFORMANCE STANDARDS FEEDLOTS POINT SOURCE CATEGORY, Environmental Protection Agency, Washington. D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G.

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SYNTHETIC RESINS SEGMENT OF THE PLASTICS AND SYNTHETIC MATERIALS MANUFACTURING POINT SOURCE CATEGO-

RY, Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W76-01209

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SMELTING AND SLAG PROCESSING SEGMENTS OF THE FERROALLOY MANUFACTURING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G.

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE DAIRY PRODUCT PROCESSING POINT SOURCE CATEGORY.

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G.

W76-01211

W76-01210

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR UNBLEACHED KRAFT AND SEMICHEMICAL PULP SEGMENT OF THE PULP, PAPER, AND PAPERBOARD MILLS POINT SOURCE CATEGORY,

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G.

W76-01212

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BASIC FERTILIZERS CHEMICALS SEG-MENT OF THE FERTILIZER MANUFACTUR-ING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington,

D.C. Effluent Guidelines Div.

For primary bibliographic entry see Field 5G. W76-01213

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE STEEL MAKING SEGMENT OF THE IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY,

Environmental Protection Agency, Washington, D.C. Effluent Guelines Div. For primary bibliographic entry see Field 5G. W76-01214

DEVELOPMENT DOCUMENT FOR EFFLUENT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE INSULATION FIBERGLASS MANUFACTURING SEGMENT OF THE GLASS MANU-FACTURING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G. W76-01215

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR SOURCE PERFORMANCE STANDARDS FOR THE APPLE, CITRUS, AND POTATO PROCESSING SEGMENT OF THE CANNED AND PRESERVED FRUITS AND VEGETABLES POINT SOURCE CATEGORY,

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G. W76-01216

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BUILDING, CONSTRUCTION, AND PAPER SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY, Environemental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G. W76-01217

PROMISING TECHNOLOGIES FOR TREAT-MENT OF HAZARDOUS WASTES, National Environmental Research Center, Cincinnati, Ohio.

R. E. Landreth, and C. J. Rogers

Available from the National Technical Informa-tion Service, Springfield, Va 22161, as PB-238 145, \$4.00 in paper copy, \$2.25 in microfiche. EPA Report 670/2-74-088, November, 1974. 45 p, 6 fig, 47

Descriptors: *Waste water treatment, *Industrial wastes, *Toxicity, Wastes, Water pollution wastes, *Toxicity, Wastes, Water pollution sources, Water pollution treatment, Heavy metals, organic compounds, Acids, Alkalis(Bases), Solid wastes, Liquid wastes, Pesticides, Biological treatment, Ion exchange, Microwaves, Radiation, Osmosis, Activated carbon, Adsorption, Water pollution control, Waste treatment, Hazards, Chlorination, Chlorine, Catalysts, Oxidation, Biodegradation.
Identifiers: *Ultrafiltration.

Numerous toxic and hazardous wastes are being generated and improperly treated and disposed of by industrial sources. This study was undertaken to identify and recommend promising treatment technologies for these wastes. Literature searches, site visits, and personal communications with experts in the field provided the basis for identifying needed treatment technologies. Most hazardous waste streams are mixtures of pesticides, heavy waste streams are mixtures of pesticides, neary metals, organic solvents, acids, or bases, and have a high solids concentration. Treatment processes that appar applicable for processing both homogeneous and heterogeneous hazardous waste streams include chemical, biological, and physical treatments. Recommended promising techniques for treating hazardous waste streams include chlorinolysis, decomposition by acids, and bases, chemical oxidation, biological degradation, cataly-sis, ion-exchange, photochemical processing, low temperature microwave radiation, osmo-sis/ultrafiltration, and activated carbon adsorption. (Witt-IPC) W76-01219

REMOVAL OF PESTICIDES BY REVERSE OS-

MOSIS, Illinois Univ. at Urbana-Champaign. Dept. of Civil

E. S. K. Chian, W. N. Bruce, and H. H. P. Fang. Available from the National Technical Informa-tion Service, Springfield, Va 22161, as AD/A-005 591, \$3.50 in paper copy, \$2.25 in microfiche. En-vironmental Science and Technology, Vol 9, No 1, p 52-59, January, 1975. 2 fig, 24 ref, 4 tab.

Descriptors: *Pesticides, *Reverse osmosis, Membrane processes, Separation techniques, Pollu-tants, Water pollution sources, Waste water treat-ment, Chlorinated hydrocarbon pesticides, Organophosphorus pesticides, Organic pesticides, Water quality control. Membranes, Water pollu-Identifiers: Cellulose acetate, Polyethylenimine.

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OS-Civil Two types of reverse osmosis membranes, i.e., cellulose acetate and cross-linked cross-linked cellulose acetate and cross-linked polyethylenimine (designated NS-100 by the Office of Saline Water), were evaluated for efficiency of removal of a wide variety of pesticides, including chlorinated hydrocarbons, organophosphorus, and miscellaneous pesticides. With each membrane the rejection of pesticides was better than 99%. A considerable amount of pesticide was adsorbed onto the membrane materials. The attent of despation in automated in the control of the contro als. The extent of adsorption is governed by van der Waals-London forces and hydrophobic bond-ing between pesticide molecules and the polymeric membrane materials. Membrane rejection of the pesticides is in turn governed by the polarity of the solute molecules in aqueous solution, which is in accord with the theory advanced by Sourirajan. (Witt-IPC)

BASICS OF POLLUTION CONTROL.

W76-01223

Gurnham and Associates, Inc., Chicago, Ill. Available from the National Technical Informa tion Service, Springfield, Va 22161, as PB-238 512, \$4.00 in paper copy, \$2.25 in microfiche. Gurnham and Associates, Inc., Chicago, Ill., (1973). 44 p, 1

Descriptors: *Dairy industry, *Water pollution sources, *Pollutant identification, Water pollution, Wastes, Industrial wastes, Wisconsin, Pollutants, Farm wastes, Waste water(Pollution), Surveys, Flow measurement, Analytical techniques, Equipment, Sampling, Water analysis. Identifiers: Seminars

This text outlines the technical measurements used by pollution control technologists, as they apply to the dairy industry, and defines the technical terms used in federal, state, and local laws controlling waste water discharges from dairies. Sources of water borne wastes from dairies are listed, and the significance, loadings, and limitations for each and methods of analysis are tions for each and methods of analysis are described. A program for conducting a plant waste water survey, for the purpose of determining specific sources of pollution and measuring the quantities of each, is outlined. The appendix is a paper (by C. F. Gurnham and M. I. Beach) that explains the devices and techniques used for measuring flows and for sampling waste water streams. (Witt-IPC) W76-01228

BIOLOGICAL TREATMENT OF SHIPBOARD

SANITARY WASTE WATER, Merchant Marine Academy, Kings Point, N.Y. W. H. Bailey.

Available from the National Technical Informa-tion Service, Springfield, Va 22161, as COM-75-10178, December, 1974. 71 p, 16 fig, 33 ref, 13 tab.

Descriptors: *Sewage treatment, *Biological treatment, *Ships, Water pollution sources, Waste water treatment, Water pollution treatment, Water pollution control, Water pollution, Waste treat-ment, Sewage, Water purification, Domestic wastes, Legislation, Waste disposal, Inland water-ways, Sea water, Filters. Identifiers: *Shipboard sewage treatment, Rotating-Disc Bio-Surf process, Klock submerged filter process.

The biological treatment of shipboard waste water The biological treatment of shipboard waste water and the pollution problems caused by this waste water are discussed. The study evaluates two of the most efficient biological sanitary waste water treatment systems adaptable for shipboard use, namely, the Rotating Disc Bio-Surf process and the Klock Submerged Filter process. These processes are most advantageous from a cost/benefit point of view, as opposed to purely mechanical/chemical units. The Bio-Surf system consists of a large number of plastic disks which consists of a large number of plastic disks, which are mounted on a horizontal shaft and rotated while approximately one-half their surface areas are submerged in the waste water. In rotation, the where it trickles down the surface of the disks and absorbs oxygen. In the Klock process, waste water is circulated through the culture-laden growth medium in a baffled tank arrangement making repeated and intimate contact with large portions of the biological material. The biological treatment of wastes, composition of sewage, and regulations covering the disposal of shipboard wastes, and the problem of waste disposal from boats navigating inland waterways are considered. W76-01229

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SECONDARY ALUMINUM SMELTING SUBCATEGORY OF THE ALUMINUM SEGMENT OF THE NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGO-

RY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G. W76-01231

EFFICIENCY OF OIL SPILL REMOVERS.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 900-T, \$4.00 in paper copy, \$2.25 in microfiche. English translation of Revue des Travaux de Institut des Peches Maritimes, Vol 36, No 1, p 85-102, 1972. 13 fig, 11 ref, 3 tab.

Descriptors: *Oil spills, *Water pollution sources, Disaster, Oil pollution, Water pollution control, Water pollution, Efficiencies, Oil, Translations, Foreign research, Chemical precipitation, Emul-sifiers, Surfactants, Europe, Organic compounds, Marine bacteria, Toxicity, Aquatic microorgan-

Identifiers: France.

The results of a study comparing the efficiency of 3 types of chemicals (emulsifiers, agglomerants, and precipitants) in cleaning up oil spills on water are presented. The study was carried out in the laboratory, using standard methods, in order to obtain accurate and reproducible results. Emulsifiers (based on organic solvents) and surface-active agents convert the oil into a fine emulsion; degradation of the oil by marine bacteria follows. Agglomerants are low-density powders that absorb the hydrocarbons and facilitate their recovery, while precipitants, which are also absorbent powders but heavier than water, cause the oil to settle on the sea bottom. Of the three types of agents, emulsifiers are the easiest to use. They can be used with equal ease on the high seas or in protected areas, on floating oil, or on beaches. Only their toxicity can hamper their use when marine flora and fauna must be protected. (Witt-IPC)

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTEWATER TREAT-MENT IN AMMONIA PRODUCTION, Houston Univ., Houston, Tex. J. A. Calloway, A. K. Schwartz, Jr., and R. G.

Available from the National Technical Informa-Avanage from the National Technical Informa-tion Service, Springfield, Va 22161, as PB-237 219 \$5.00 in paper copy, \$2.25 in microfiche. Report NSF-RA-E-74-007, February, 1974. 91 p, 11 fig, 20 ref, 8 tab. NSF GI 34459.

Descriptors: *Ammonia, *Waste water treatment, *Water utilization, *Chemical wastes, Linear programming, Model studies, Water supply, Water resources, Energy, Texas, New Jersey, Michigan, California, Dissolved solids, Suspended solids, Heat, Injection wells, Evaporation, Ultimate disposal, Pollution taxes(Charges), Computer programs, Water consumption(Except consumptive use), Water quality standards, Water quality, Ecnomics, Industrial wastes, Costs. Identifiers: Zero discharge.

A linear programming model has been developed for evaluating the effects of increasingly restrictive waste water standards and higher costs of water withdrawals on production costs, effluent taxes, water use, and energy use in a representative ammonia plant. Specific cities were chosen to represent regions and the prevailing design parameters applicable to the respective cities were used in model development. The cities chosen include Houston, Texas; Trenton, N.J.; Saginaw, Michigan; and Sacramento, California. The following results were obtained: Zero discharges of suspended soids, heat, and total dissolved solids increased production costs by approximately 1.5% using injection wells for ultimate disposal and 3.2% using evaporative disposal techniques; zero discharges increased energy consumption by approximately 2.7%; higher costs for water withdrawals do not significantly increase production costs; effluent taxes required to achieved zero discharge vary with geographic region, ranging from 20 cents/lb for Saginaw, to 36 cents/lb for Trenton; and a water withdrawal price greater than 50 cents/million gallons is necessary before air cooling becomes feasible in any location. The model applies to new large plants rather than exist-ing facilities. A description of the ammonia production process using both natural gas and naphtha feedstocks is given. (Witt-IPC) W76-01234

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE CEMENT MANUFACTURING POINT SOURCE CATEGORY,

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

Available from the National Technical Informa-tion Service, Springfield, Va 22161, as PB-238 610, \$5.50 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-005-a, January, 1974. 115 p, 18 fig, 16 tab, 56 ref. 68-01-0599.

Descriptors: "Cements, "Waste water treatment, "Water quality standards, Water pollution treatment, Standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Water pollution control, Water quality, Evaluation, Economics, Effluents, Regulation.

Findings are presented of a study for the purpose of developing effluent limitation guidelines (setting forth the degree of effluent reduction at-(setting forth the degree of effluent reduction at-tainable through the application of the best prac-ticable control technology currently available and through application of the best available technolo-gy economically achievable, which must be achieved by existing plants by July 1, 1977, and July 1, 1983, respectively), standards of per-formance, and pretreatment standards (setting

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forth the degree of effluent reduction achievable trough the application of the best available demonstrated control technology, processes, operating methods or other alternatives) for the industry. Supporting data and rationale for the development of the proposed guidelines cement manufacturing and standards are presented.
Manufacturing processes, wastes, and waste treatment processes and their costs are discussed. (Witt-IPC) W76-01235

EXPERIMENTAL PROTOTYPE OILY WASTE-WATER TREATMENT SYSTEM.

Holt (Ben) Co., Pasadena, Calif Available fom the National Technical Information Service, Springfield, Va 22161, as AD/A-004 990, \$4.50 in paper copy, \$2.25 in microfiche. March, 1974. 63 p, 20 fig, 7 tab. N62399-74-C-0004.

Descriptors: *Oily water, *Waste water treatment, *Treatment facilities, Water pollution sources, Water pollution treatment, Water pollution control, Separation techniques, Activated carbon, Organic compounds, Emulsions, Oil pollution, Water pollution, Oil, Oil wastes, Wastes, Waste treatment, Prototypes, Equipment.

An experimental prototype oily waste water treatment system rated at 20 gpm consists of three stages: a parallel corrugated plate gravity separator, a coalescer with prestrainer and prefilter, and carbon columns for removing oil mechanical emulsions in water of varying salinity. The first two stages will normally be employed to remove free and mechanically emulsified oil from the waste water, and the third stage will be em ployed only when soluble organics are present in the waste stream, or when the second stage is producing an effluent containing more than 10 ppm of hydrocarbon. (Witt-IPC) W76-01236

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR THE CATFISH, CRAB, SHRIMP AND TUNA SEGMENTS OF THE CANNED AND PRESERVED SEAFOOD PROCESSING INDUSTRY POINT SOURCE

CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

For primary bibliographic entry see Field 5G. W76-01237

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PETROLEUM REFINING POINT SOURCE

CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guideines Div.

For primary bibliographic entry see Field 5G. W76-01238

TREATMENT OF WASTE WATERS FROM A COMBINED SEWER SYSTEM (EGYESITETT RENDSZERU CSATORNAHALOZAT SZEN-NYVIZEINEK TISZTITASA),

A. Dekei, S. Jakab, and E. Stricker. Hidrologiai Kozlony, Vol 52, No 11, p 467-476, November 1972. 9 fig, 4 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Combined sewers, Runoff, Activated sludge, Effluents, Aeration, Sludge disposal, Sewage treatment, Anaerobic digestion, Centrifugation, Incineration.
Identifiers: Hungary, Anaerobic fermentation,

Dry weather-flow

Planning and design of a combined sewage and waste water treatment facility for a 12.7 sq km urban watershed in Hungary required a maximum

yield of 9 cu m/sec as the recipient has a water yield of 0.55 cu m/sec and the dry weather waste water runoff flows at 0.60 cu m/sec. Mixed sewage water with a maximum yield of 1.5 m/sec will be treated in an activated sludge facility, while the treated in an activated sludge facility, while the remainder, generated during rainfall periods, will be stored for subsequent purification. Effluents exceeding a yield of 9 cu m/sec will be discharged directly to the receiving body, with the duration of such events not to exceed 3.1 hours per year. The waste water treatment plant, originally designed for a capacity of 30,000 cu m/day, will reduce the BOD5 content from 35-500 to 25 mg/liter. Vertical halft agrators will be used and the agration time shaft aerators will be used and the aeration time will be 4.3 hours. The sludge obtained will be concentrated from 5 to 30-35 percent by two-stage anaerobic fermentation over 33 days. Centrifugal dehydration with polymer addition, followed by incineration in a rotary furnace, is one option being considered for sludge destruction.

(Sandoski-Firi) W76-01276

TECHNICAL AND ECONOMIC OPTIMIZA-TION OF REGIONAL WASTEWATER MANAGEMENT (TECHNISCHE UND WIRTSCHAFTLICHE OPERIMIERUNG BEI DER BILDUNG VON ZWECKVERBAENDEN ZUR ABWASSERBESEITIGUNG), For primary bibliographic entry see Field 5G. W76-01277

A SURVEY OF THE MAEBASHI MUNICIPAL SEWAGE TREATMENT PLANT INSTALLATION (MAEBASHI-SHI GESUI SHORIYO NO SHISETSU GAIYO),

S. Nakashima. Gesuido Kyokai-shi, Vol 10, No 105, p 44-49, February, 1973. 2 fig, 3 tab.

Descriptors: *Treatment facilities, *Waste water treatment, Activated sludge, Aeration, Sewage, Incineration, Settling basins, Chlorination, Sludge

Identifiers: Maebashi Municipal Sewage Treatment Plant(Japan).

The construction of the Machashi Municipal Sewage Treatment Plant was started in 1962 and with gradual expansion and remodeling plans due to increased population, was completed in 1972, except for the sludge incineration process. The plant requires further augmentation and remodel-ing due to increased total area and population beyond the projected estimations. A standard activated sludge process, convertible to the step method using high speed aeration precipitation, and combined sewer drainage can treat 60,786 cu m/day on dry days, and 165,780 cu m/day during rain. The sewage BOD is 200 mg/liter with an elimination rate of 90 percent supersided with rain. The sewage BOD is 200 mg/mer with an elimination rate of 90 percent; suspended solids are 250 mg/liter with 80 percent elimination. The treatment plant comprises a sedimentation pond, the main pump, and the first settling basin. The surface loads are 44.4 and 121.1 cu m/day with settling times of 0.7 and 0.6 hours for dry and wet days respectively. The aeration tank is divided by porous walls into six chambers, with an air stirring device on one side of the wall. Complete mixing and aeration are completed in the six chambers and the sewage is sent to the final settling basin. The median adjustment wall in this basin helps the precipitation of activated sludge. The settling time is two hours after which sewage goes to a chlorine mixing pond. The sludge goes to the treatment plant, is dehydrated by a centrifugal machine, in-cinerated, and buried. (Sandoski-FIRL) W76-01278

TREATMENT IN MUNICIPAL PLANTS: IN-REMOVAL PHOSPHORUS.

Toronto Univ., (Ontario). Water Research, Vol 7, No 1-2, p 211-226, January/February, 1973. 5 fig, 2 tab, 13 ref. Descriptors: *Waste water treatment, *Treatment facilities, Activated sludge, Sludge, Phosphorus, Nutrient removal, Chemical oxygen demand. Identifiers: Phosphorus removal, Anaerobic holding. COD removal.

The concept of removing phosphorus from waste water by using a sub-stream within the plant which naturally has phosphorus concentrated considerably above the ambient concentration has been investigated. A continuous laboratory-scale plant was studied, operating under contact sta-bilization conditions and using an anaerobic holding technique on the return activated sludge; phosphorus was removed from the supernatant of the return sludge stream. The plant was operated with and without the anaerobic holding modification. Both before and after the modification, the organic carbon as measured by COD removal was of the order of 90 percent; after modification of the plant to release the phosphorus from the return sludge stream, phosphorus removals jumped from 10 to 30 percent up to a high of 75 to 90 percent removal. A very slight decrease in sludge activity could be observed due to anaerobic holding, but the very slight reduction in COD removal was more than offset by the increased removal of soluble phosphorus through the supernatant of the return sludge line. (Sandoski-FIRL) W76-01279

USING INTERMEDIATE STORM-WATER RE-TENTION TANKS (RUEB) INSTEAD OF RAIN OUTLETS (RUE) AT SUBSEQUENT ENLARGE-MENT OF RATE OF FLOW OR OF MIXING RATE (DIE ZWISCHENSCHALTUNG VON REGENUEBER-LAUFBECKEN (RUEB) AN-STELLE VON REGENUEBERLAEUFEN (RUE) NAUHTRAEGLICHER VERGROES-SERUNG DER WASSERMENGE ODER DES MISCHVERHAELTNISSES), R. Lautrich

Wasser und Boden, No 2, p 41-43, 1973. 2 fig, 2

Descriptors: *Data processing, *Sewage, *Waste water treatment, Storm water, Rainfall, Industrial wastes. Flow Identifiers: Retention tanks, Sewage load

An electronic data processing program providing for the computation of sewage load to the main canal during one rainfall and during one year is presented. Parameters taken into consideration included: in- and out-flow times within one settlement area between a sequence of storm water retention tanks; flow detention; annual precipitation and rainfall frequency; intermittent additional water inflow; distribution of sewage water accumulation satisfying local conditions; industrial waste water inflow dependent on various fluctuations; and the settling effect of the storm water retention tanks as affected by water detention time. In addition, BOD5 computation is included in this program. Results from evaluation indicate that the total annual main canal sewage load can be reduced by applying a series of intermediate retention tanks, sized with the account of different settling times. (Sandoski-FIRL)
W76-01280

THE EFFICIENCY OF IMMERSED TRICKLING FILTER PLANTS IN THE PRACTICE (DIE LEISTUNG VON TAUCHTROPFKOERPERAN-LAGEN IN DER PRAXIS),

Kh. Krauth, and K. F. Staab. Gas und Wasserfach, Wasser/Abwasser, Vol 114, No 1, p 34-39, 1973. 5 fig, 9 tab, 4 ref.

Descriptors: *Waste water treatment, *Trickling filters, Investigations, Treatment Sewage treatment, Digestion tanks.

Information on the procedures and results of a series of 14 investigations conducted during 1969 through 1971 at main collector sewage treatment

plants and house facilities with digestion tanks are plants and nouse facilities with digestion tanks are detailed. Sewage was sampled proportionally with the water quantity from the intake at the immersed trickling filters and from the drainage. The analysis was carried out for the consumption of KMn04, BOD5, total phosphorus, total nitrogen, and for the oxidized nitrogen in the drain. The relationship between the surface load and the cleaning rate was studied, and in evaluating the data ob-tained, the pretreatment of the sewage was taken into consideration to prevent misinterpretation. Data indicate that concentration in a drain of equal or less than 25 mg BOD5/liter can be obtained when the load is equal or less than 10 grams BOD5/sq m per day. Also if 90 percent of all the values cannot exceed a drain concentration of equal or less than 25 mg BOD5/liter, then the sur-face load cannot exceed 3.0 to 4.0 grams BOD5/sq m xd. (Sandoski-FIRL) W76-01282

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EXPERIMENTAL PROGRAM FOR UNWATER-ING DIGESTED DOMESTIC SEWAGE SLUDGE UNDER PLANT CONDITIONS (TERV A ROTHASZTOTT VAROSI SZENNYVIZTELEPI ISZAP UZEMI LETERE), VIZTELENTESI

For primary bibliographic entry see Field 5E. W76-01283

WASTE WATER QUANTITIES, TREATMENT AND REMOVAL IN COMMUNITIES AND IN-DUSTRIES IN THE FEDERAL REPUBLIC OF GERMANY (ABWASSER-ANFALL, BEHAN-DLING AND BESEITIGUNG IN GEMEINDEN UND INDUSTRIEBETRIEBEN IN DER BRD). Staedtehygiene, Vol 24, No 1, p 12-15, 1973. 1 tab.

Descriptors: *Waste water treatment, *Treatment facilities, Biological treatment, Cities, Rural areas, Sewage, Sewerage, Population, Industrial wastes. Identifiers: Germany.

In the Federal Republic of Germany, 17.5 million cubic meters of waste water are drained daily to the public sewer, of which 49.8 percent is domestic and commercial, and 36.9 percent industrial waste water. Prior to discharge, 47.4 percent of the waste water is treated in biological treatment plants and 28.4 percent, undergoes mechanical treatment. Presently, many small communities do not have sewage and/or waste water treatment; in major cities about one third of the waste water quantity is treated biologically and about 40 percent treated mechanically. In the future, the sewer system in the rural regions will be completed, similar to that in cities with more than 100,000 inhabitants in which more than 90 percent of the population is connected to sewers. It is projected that from 1969 to 1985 domestic waste water quantities will in-crease from 8.7 to 14.7 million cu m/day. This translates to new biological treatment facilities for 19.6 million inhabitants in addition to the mechanical and partly biological treatment plants already planned or in use for 18.1 million people. (Sandoski-FIRL) W76-01284

KINETIC MODELING OF AERATION BASINS, Texas Univ. at Austin. Dept. of Chemical Engineering. F. de Villaret, and D. M. Himmelblau.

Journal Water Pollution Control Federation, Vol

45, No 2, p 292-303, February, 1973. 13 fig, 1 tab,

Descriptors: *Model studies, *Waste water treatment, Aeration, Biological treatment, Treatment facilities, Mathematical models. Identifiers: Aeration basins, Microbial population,

Aeration basins are widely used in secondary waste water treatment and can usually be represented by some type of mathematical model. This study, concerned with the representation and

interpretation of the kinetic portion of models of aeration basins, uses a somewhat different approach to the modeling of the biological reactions in that it accounts for the individual components of the substrate but treats the microbial population as a homogeneous mass. Validity of the proposed treatment has been demonstrated by experimenta-tion in both batch and continuous laboratory aeration tanks. In view of the need for control and analysis in biological waste water treatment plants, it is beneficial that the kinetic coefficients of the process model be obtained from such laboratory systems. When introduced into models of the waste water treatment process together with mixing or dispersion parameters obtained in the plant on the actual equipment, predictions for plant operation and design can be made. The models represent not only steady-state operation but also transient responses caused by changes in plant loading and process upsets. (Sandoski-FIRL) W76-01286

AERATED LAGOONS PROVIDE EFFECTIVE TERTIARY TREATMENT, Itasca III

No. 3, p. 97-98, March, 1973. 4 fig.

Descriptors: *Aerated lagoons, *Waste water treatment, *Tertiary treatment, Activated sludge, Sewage, Sludge disposal, Aeration, Biochemical oxygen demand, Flow, Illinois. Identifiers: Itasca(Ill), Settling tanks, Vacuum fil-

Completed in 1969, aerated lagoons supplement a conventional activated sludge plant in Itasca, Illinois and this arrangement has avoided several potential problems. The city of 5000 has a present average dry-weather flow in the sewer system of about 0.5 mgd. The activated sludge plant consists of four primary settling tanks, two aeration tanks, a final settling tank, and a sludge disposal system a tinal setting tank, and a studge disposal system consisting of a holding tank and a vacuum filter for dewatering the sludge. Aeration is provided by the valved tubing arrangement laid transversely to form 290 lines, with the distances between lines increasing with distance from the inlet. With air rising laminarily from the tubing, it creates linear 'air ing laminarily from the tubing, it creates linear air screens', separating the lagoons into treatment cells. Four blowers are provided, two rated at 15 hp each to deliver 230 cfm of air at 10 psi, and two rated at 5 hp each to deliver 80 cfm at 9 psi. These are used alternately as 20-hp pairs furnishing 310 cfm. The lagoons were sized to accept a daily BOD loading of 562 pounds. The sides are sloped on a ratio of 1 to 4.17. The retention period at design average flow is 1.9 days. (Sandoski-FIRL) W76-01287

DECONTAMINATION THROUGH MATER DECOMMENDED INSUEM RAIN WATER TREATMENT IN STORM WATER RETENTION TANKS (ENTLASTUNG DER GEWASSER DUCH BEHANDLUNG DES REGENWASSERS IN REGENUEBERLAUF-

For primary bibliographic entry see Field 2E. W76-01289

THE SEWERS OF PARIS (LES EGOUTS DE PARIS),

Paris (France).

M. Ganneau. Travaux, No 455, p 40-45, February, 1973. 8 fig.

Descriptors: *Sewers, *Treatment facilities, *Sewerage, Siphons, Storm runoff, Combined Descriptors:

sewers, Water supply.
Identifiers: Paris, France, Gravity sewers.

Through the sewers of Paris, effluents are chan-neled by five gravitational collectors, with slopes of 0.20 m/km, into waste treatment plants located in the north and northwest from Paris. When

necessary, the collectors are conducted underneath the Seine bed by means of siphons. High storm water runoff loads occurring in the mixed sewage system are leveled off by retention basins. The sewage system also accommodates water supply pipes, telephone and other communication lines. (Sandoski-FIRL) W76-01293

NEEDS AND PLANS IN THE DEVELOPMENT OF URBAN AND RURAL SEWER SYSTEMS (POTRZEBY I PLANY ROZBUDOWY SIECI KANALIZACYJNEI W MIASTACH

OSIEDLACH), For primary bibliographic entry see Field 8A. W76-01294

THE ELIMINATION OF PHOSPHATES AND NITRATES OF WASTE WATER BY ALGAE CULTURES: I (/N FLEMISH), Ghent Rijksuniversiteit (Belgium). Laboratorium

voor Anorganiche Technische Chemie, Elektroter-mie en Elektrochemie.

F. M. Bosch, H. Lootens, and E. Van Vaerenberch

Natuurwet Tijdschr. Vol 54, No 4/5, p 109-116, 1972. Illus. (Engl. summ.).

Descriptors: *Phosphates, *Nitrates, *Waste water disposal, Waste water treatment, *Algae. Identifiers: Chlorophyll, Cultures.

The removal of P and N by algae is the 3rd step in the purification of waste water. The concentration of P and N and the amount of chlorophyll a, as a measure for the growth of algae, are determined as a function of time.--Copyright 1974, Biological Abstracts, Inc. W76-01312

FACTORS AFFECTING ADOPTION OF LAND TREATMENT OF MUNICIPAL WASTE

WATER. North Carolina State Univ. at Raleigh. Dept. of

Economics and Business.
G. A. Carlson, and C. E. Young

Water Resources Research, Vol 11, No 5, p 616-620, October 1975. 1 fig, 3 tab, 6 equ, 21 ref.

Descriptors: *Waste water treatment, *Water pol-lution control, *Regression analysis, Land, Technology, *Economics, Municipal wastes, Data collections, Demand, Prices, Decision making, Probability, Constraints, River flow, Rainfall, Labor, Capital, Irrigation water, Volume, Mathe-matical models, Systems analysis, Estimating, Equations.

Identifiers: *Land treatment, Nonlinear regression, Demand curve, Empirical analysis, Log linear, Linear model, Federal funding, Byproduct

A demand curve for land treatment of municipal waste water is derived assuming a profit-maximizing framework. The outputs of a waste treatment facility are taken to be volume of waste water, degree of waste removal, and potentially marketable by-product. The demand curve for land treatment is estimated by utilizing data collected from 125 U. S. cities. The dependent variable is adop-tion or nonadoption of land treatment, and coefficients are estimated by nonlinear regression. The price of byproducts (water), required degree of treatment, price of capital, and local construction cost share all significantly increase adoption. Volume of river flow, rainfall, and volume of effluent flow all have a significant negative effect on adoption. Land prices were insignificant, a factor which is believed to be due to the nonpurchase of land by many land treatment facilities. (Bell-Cor-

W76-01329

Group 5D—Waste Treatment Processes

WATER REUSE: A FLEXIBLE AND EFFICIENT MANAGEMENT ALTERNATIVE FOR MUNICIPAL WATER SUPPLY, Butler Univ., Indianapolis, Ind. Holcomb

Butler Univ., Indianapolis, Ind. Holcomb Research Inst. D. M. Dworkin.

Water Resources Research, Vol 11, No 5, p 607-615, October 1975. 6 fig, 8 tab, 19 ref.

Descriptors: *Water supply development, *Water reuse, *Simulation analysis, *Water management(Applied), *Alternative planning, Municipal water, Reservoirs, Streamflow, Economics, Economic efficiency, Costs, Effluents, Water utilization, Mathematical models, Systems analysis, Water quality control, Colorado.

Identifiers: *Colorado Springs(Colo), Program expansion.

There is an increased interest in water reuse to supplement present supplies or to be incorporated in future plans, due to the decreasing availability of conventional sources, the better-quality effluent being discharged under stricter pollution control regulations, and the federal legislation requiring the consideration of reuse as an alternative water supply source. Herein, a comparison between the fixed schedule of planned expansion of water supply sources and an alternative expansion program based on a short-term decision from monitoring reservoir levels, water use, and streamflows and employing water reuse capacity and new source development is simulated for the Colorado Springs municipal water system. For this complex, fast growing system with supply based on streamflows and some current reuse capacity, the alternative plan postpones major new develop-ment an average of 14 years at a cost at present value of half the original planned expansion; the alternative is more efficient since (1) it would allow demands on the system to rise without increasing conventional capacity and (2) it could substitute for high levels of assurance. A minimum requirement of present planning for renovation or reuse of water is the modification of systems to include a physical cross connection between the two, allowing water to be used interchangebly for nonpotable purposes, and a common management process to make such decisions. (Bell-Cornell) W76-01330

NOW, NO ODOR WASTE HANDLING,

R. J. Fee. Successful Farming, Vol 71, No 9, p K14, August, 1973. 2 fig.

Descriptors: *Odor, *Waste treatment, *Hogs, *Farm wastes, Centrifugal pumps, Sewage, Costs, Effluents, *Iowa. Identifiers: Pits.

A new concept in odorless waste handling for hogs is being used on the Orville Luedtke farm in Iowa. The basic principal of the Rem-Ox system is that its uses atmospheric oxygen to maintain an aerobic condition in the waste for fast, odor free organic material digestion. All waste treatment is done within the building, using centrifugal force, circulating sewage pumps to agitate and aerate the material in the pits. The 'racetrack design' pits in the Luedtke's system can be much more shallow than usual. The centrifugal force sewage pumps are placed at strategic locations to propel the effuent in a circular fashion around the building. Costs depends on the size and type of structure. Sizing of pumps and motors is based primarily on the daily animal manure input into the system. (Cameron-East Central Oklahoma State)

THE HIGH COST OF RUNOFF CONTROLS: IS HELP NEEDED.

The Furrow, p 14-15. March, 1975.

Descriptors: *Costs, *Agricultural runoff, *Control systems, *Feed lots, Livestock, *Cost

sharing, Farm wastes, Water pollution control, *Waste treatment.

Identifiers: Rural Economic Assistance Program.

New state and federal laws governing runoff control from feedlots will be costly for all livestock producers and may force the smaller ones out of business. Michigan State University economists estimate that runoff controls would costs from \$3.98 to \$14.37 per head for feedlots with 1,000 head or more, and they could run higher for smaller operations. USDA economists estimate control costs for northern areas could costs \$25 per head for a 150-cow dairy and more for smaller dairies. The USDA approved a cost-sharing program (REAP) in 1973 which enabled a producer to receive up to 80 percent of the total costs for runoff controls with a maximum of \$2,500. The \$2,500 ceiling on funds provides little relief for the impact of control costs of large feedlot operations, however, large operations can pass these costs on to consumers more easily than smaller operations. Cost sharing programs for 1975 are questionable because there were no cost-sharing programs in 1974. (Battles-East Central Oklahoma State)

THE ANAEROBIC DIGESTION OF WASTE FROM AN INTENSIVE PIG UNIT, Rowett Research Inst., Bucksburn (Scotland).

P. N. Hobson, and B. G. Shaw. Water Research, Vol 7, No 3, p 437-449, 1973. 1 fig. 13 tab. 14 ref.

Descriptors: *Anaerobic digestion, *Waste treatment, *Hogs, *Farm wastes.
Identifiers: *Loading rates.

Anaerobic digestion was investigated as a primary Anactoric digestion was investigated as a primary treatment for very strong agricultural wastes, to reduce the solids and polluting properties and to improve the settling of the waste in order to give a supernatant liquid which, while not up to river board standards would be suitable for discharge to town sewers, for secondary aerobic or other treatment, or for recycling as animal house washwater. Six experiments were run. Experiments 1 and 2 concerned batch digestion of waste. The experiments showed that a proper digestion, with the primary acidic and secondary methanogenic fermentation in balance, could not be developed by direct incubation of undiluted or almost undiluted. pig waste. Experiment 3 showed that a balanced digestion of piggery waste could be obtained using a seed of digesting sewage, but that loading rate in the early stages of the digestion could be a critical factor. Experiment 4 showed that a balanced digestion of piggery waste could be achieved without a seed if the initial loading rate was low enough to allow a methanogenic flora to develop before a high acid concentration was reached. Experiments 5 and 6 dealt with performance of initially seeded and unseeded digestions at different loading rates. These two experiments revealed that balanced digestion could be obtained by using, initially, low loading rates and allowing time for the build-up of a stable population of the correct bac-teria. (Cartmell-East Central Oklahoma State)

THERMOPHILIC BACTERIAL OXIDATION OF

HIGHLY CONCENTRATED SUBSTRATES, Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft.

F. Popel, and C. H. Ohnmacht. Water Research, Vol 6, p 807-815, 1972. 6 fig, 3 tab, 9 ref.

Descriptors: *Thermophilic bacteria, *Farm wastes, *Oxidation, Aerobic bacteria, Sewage sludge, *Waste treatment. Identifiers: Mesophilic bacteria, Pasteurization,

Disposal of substrates with high amounts of pathogenic bacteria and oxidizable organic matter

can be accomplished without polluting resources after proper stabilization, pasteurization, and deodorization. This is accomplished by heating them long enough to degrade the pathogenic bacteria and organic matter. The heat is provided by exothermic reactions in aeration tanks to which the sludge has been added. The sludge must be continually recirculated to aid mesophilic and/or thermophilic bacteria and to provide an oxygen balance in the circulating liquid. Exothermic reactions heat the substrates up to 65-70 degrees centigrade which accelerates the rate of degradation of the organic matter and pasteurization of the substrates. Also large quantities of humus compounds are produced during the oxidation. This process can be used on highly concentrated substrates with a high BOD5 such as sewage sludge, liquid manure from animals, or industrial waste. (Russell-East Central Oklahoma State)

TROUT METABOLISM CHARACTERISTICS AND THE RATIONAL DESIGN OF NITRIFICA-TION FACILITIES FOR WATER REUSE IN HATCHERIES.

Texas Univ. at Austin. Dept. of Civil Engineering. R. E. Speece.

Transactions of the American Fisheries Society, Vol 102, No 2, p 323-334, April 1973. 14 fig, 12 ref.

Descriptors: *Trout, *Metabolism, Data collections, *Nitrification, *Water reuse, *Fish hatcheries, Oxygen requirements, Ammonia, Suspended solids, Temperature, Feeding rates, Biochemical oxygen demand, Water pollution effects, Treatment facilities.

An attempt is made to bring together the available information on trout metabolism and nitrification with the objective of establishing a rational procedure for the design of nitrification facilities for water reuse in trout hatcheries. The same rationale can be used for other types of fish through the use of the appropriate ammonia production, oxygen requirement, and water requirement data Data have been taken from the literature on trout culture to mathematically define the ammonia production, oxygen requirements, BOD and SS production, water requirements, and loading rates as a function of trout length and water temperature. The temperature dependence of feeding rate and nitrification capacity has been incorporated into a nomograph which predicts the nitrification volume requirements for recycling. Another nomograph was constructed to predict water flow requirements and pollution resulting from trout hatchery operation. (Cartmell-East Central Oklahoma State) W76-01382

CONFINEMENT LIVESTOCK FACILITIES WASTE MANAGEMENT CODE OF PRACTICE. Alberta Environment. Edmonton, Alberta, Canada, September 1973, 31 p, 7 fig, 4 tab.

Descriptors: *Canada, *Confinement pens, *Farm management, Design, Odor, Livestock, Farm wastes, Treatment facilities, Waste treatment. Identifiers: Isolation distances, Waste handling, Land application, Alberta.

Public concern about all forms of pollution of the environment is growing while intensive livestock operations are increasing in number and size. The number of residential dwellings on or near farmland is increasing. Developers of non-agricultural activities in agricultural areas should be aware that complete odor control is beyond present technical capabilities. These guidelines stress that when conflicts result from encroachment on agricultural areas, much of the responsibility should be accepted by the developers and not only the agricultural operator. Guidelines for confinement livestock facilities waste management intend to provide a technical base upon which livestock

operation can develop without causing undue enoperation can develop window causing undue divironmental impact. Administration and definitions regarding the guidelines are given. The guidelines are defined in terms of developments requiring compliance and the isolation distances. The various components of design guidelines for livestock facilities are listed and examined. The components include manure storage, earthen catch basins (and alternate methods), walled storage, storage lagoons and mechanically aerated systems. The guidelines for animal waste manage-ment, including the handling of solid and liquid manure, are discussed. Land application is also examined. Directions for the procedure for using the code are given. (Kehl-East Central Oklahoma State) W76-01386

AGRICULTURAL WASTES, (LITERATURE

REVIEW), Mississippi State Univ., State College. E. C. McGriff, Jr., and A. Shindala.

Journal Water Pollution Control Federation. Vol. 45, No 6, p 1167-1173, June, 1973. 63 ref.

Descriptors: *Reviews, *Bibliographies, *Farm Descriptors: "Reviews, "Bibliographies, "Farm wastes, *Livestock, Chemical properties, Physical properties, Waste treatment, Lagoons, Fuels, Recycling, Waste disposal, Methane, Feeds, Legal aspects, Regulation, Permits. Identifiers: Land disposal, Pyrolysis.

This review of data from many investigators con-cerns waste characteristics, pollution abatement practices, waste use and reuse, and waste manage-ment and legal action. Specific investigations are cited. (Frantz-East Central Oklahoma State)

OCEAN OUTFALLS AND OTHER METHODS OF TREATED WASTE-WATER DISPOSAL IN SOUTHEAST FLORIDA, (ENVIRONMENTAL IMPACT STATEMENT).

Environmental Protection Agency, Atlanta, Ga. Region IV

Available from National Technical Information Service, Springfield, Va 22161 as EIS-FL-73-0491-F-1, \$18.75 in paper copy, \$2.25 in microfiche. March, 1973. 745 p, 47 fig, 106 tab.

Descriptors: *Human diseases, *Sewage disposal, *Sewage bacteria, *Environmental effects, Reefs, Sewage effluents, Schools(Fish), Waste Sewage water(Pollution), Water management(Applied), Water (Volume), Discharge (Water), In-lets (Waterways), Algae, Recreation, Bottom sedi-ments, Chemical degradation, *Florida. Identifiers: *Environmental impact statements,

*Mangrove swamps, Gulf Stream.

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The project, an ocean outfall of secondarily treated sewage into the ocean off Southeast Florida, calls for a 50 mgd outflow of sewage into the Gulf Stream which would probably be insufficient to disperse the materials from Florida beaches or dilute them to insignificant levels. Potential negative effects of continued presence of nutrients, viruses and poisons present in the ef-fluent include the danger to public health of re-sidents of Palm Beach, Broward, and Dade Counties, primarily through direct viral infection and reduced availability of uncontaminated fresh water. Commercial and recreational use of the offshore waters might be reduced due to fish kills. an increase in presence of blue-green algae which alters coral reef vitality, damage to fishing and auters coral reer vitality, damage to rishing and tourist interests due to poisoned shellfish, shrimp and fish caught near outflows, as well as increases in mangrove swamp pests. The Environmental Protection Agency (EPA) and the governments of West Palm Beach and other local communities support the proposals as safe techniques affording the best available technical solution to segage disposal. A second related group recognizes the dangers of ocean outfall but continues to prefer it a solution. Environmentalists, academic

representatives and professional consultants tend to form a third group, which proposes alternatives to the ocean outfall in order to recover highly purified fresh water, safeguard resident health and minimize damage to ocean inhabitants, sport and commercial fishing and recreation. (Knocke-W76-01413

REUSE OF EFFLUENT FOR AGRICULTURAL

Commonw. alth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.

P. Jakobsen, and R. Wetselaar.

Water (Journal of the Australian Water and Waste-water Association) Vol 2, No 2, p 10-16, June 1975. 3 tab. 59 ref.

Descriptors: *Water reuse, *Irrigation water, *Water quality, *Metals, Nutrients, Salinity, Industrial wastes, Effluents, Toxicity, Pesticides, Detergents, Soil contamination, Reviews.

The more fundamental aspects of the quality of effluent and its effects on agricultural systems are reviewed, with particular reference to its metal content. The implications of the chemical characteristics of major and minor nutrients, non-essential elements, pesticides and detergents are discussed in relation to potential occurrences of excesses following irrigation with industrial waste water. Associated potential hazards of salinity and pathogenic organisms are also considered. (CSIRO) W76-01416

POLLUTION OF RECIPIENTS BY STORM RU-NOFF IN MIXED SEWER SYSTEMS: STORM RETENTION BASINS AS A REMEDY (LA POL-LUTION DES EMISSAIRES PAR LES DEVER-SEMENTS DES RESEAUX UNITARIES: UN REMEDE LES BASSINS D'ORAGE),

Techniques et Sciences Municipales--LEau, Vol 70, No 7, p 313-317, July, 1975. 7 fig, 6 tab, 14 ref.

Descriptors: *Storm runoff, *Sewerage, *Retention, Biological treatment, Waste water Descriptors: treatment, Water pollution sources, Biochemical oxygen demand, Water pollution control, Rain water. Combined sewers. Identifiers: Retention basins, Baden-Wuerttem-

A method for the control of the pollution of recipients by storm runoff in combined sewer systems in Baden-Wuerttemberg, Germany, is discussed. The BOD content and the pollutant load were measured. It was determined that the storm runoff, especially that discharged during the initial phase of rain, is often as polluted as the effluents that occur during dry weather. Therefore, reten-tion of the initial runoff in retention basins for subsequent biological in-plant treatment is necessary. Storm runoff retention basins have been designed to retain 90% of the annual BOD5 content in the Baden-Wuerttemberg area. (Takacs-FIRL) W76-01427

HOW MANY WASTEWATER TREATMENT PLANTS ARE NECESSARY IN REGIONAL SEWER SYSTEMS. (HANY SZENNYVIZTISZ-TITO TELEP LEGYEN A REGIONALIS CAA-TORNAERNDSZEBEN).

Hidrologiai Kozlony, Vol. 55, No. 4, p. 164-167, April, 1975. 1 fig, 1 tab.

Descriptors: Sewerage, *Waste water treatment, *Treatment facilities, Regional development, Costs, Biological treatment, Waste disposal, Irrigation, Lakes. Identifiers: Lake Balaton(Hungary), Sewer pipes.

Economic and technological optimization of regional sewer systems and waste water treatment plants is described, based on optimization calculations for the regional sewer system planned for Lake Balaton in Hungary. The costs of regional sewer systems are composed of sewer and treatment plant costs. Increasing the number of waste water treatment plants in regional systems reduces the cost of the sewer system, as it becomes possible to reduce the diameter of the long-distance sewer pipes. The specific costs per cubic meter of treated waste water depend primarily upon the required degree of purification. Optimization calculations revealed the need for five mechanical waste water treatment plants for the Lake Balaton regional system when using the waste water for irrigation after settling for two hours. This optimum may be reduced to two to three plants if biological treatment is applied before discharge recipients. One or two large-capacity treatment plants with three steps will be required for purification if the purified water is to be discharged into the lake. (Takacs-FIRL) W76-01429

WET OXIDATION DISPOSAL OF WASTE MATTER IN SUSPENSION.

For primary bibliographic entry see Field 5E. W76-01430

SEWAGE AFRATION TURBINE.

South African Patent ZA 7305-730. Issued February 21, 1975. Derwent French Patents Abstracts, Vol W, No 22, p D1, July, 1975.

Descriptors: *Patents, *Aeration, *Sewage treatment, Equipment, *Waste water treatment. Identifiers: *Aeration turbine.

A sewage aeration turbine has been patented. The device consists of an axial flow impeller, designed to rotate below the surface of a liquid body; and a drive mechanism coupled to the impeller to rotate it. The impeller includes several radially extending propeller blades. At least some of these are hollow and have one or more openings which permit the passage of gas into the liquid from the interior of the hollow blades. Equipment located above the liquid surface communicates with the interior of the hollow blades to deliver the gas. Thus, the gas flows out the openings in the blades as the blades rotate to impel the liquid. (Kramer-FIRL) W76-01431

POLLUTED WASTE WATER PURIFICATION. Soviet Patent SU 437719. Issued January 3, 1975. Soviet Inventions Illustrated, Vol W, No 24, p D1-D2, July 22, 1975.

Descriptors: **Patents, *Waste water treatment, *Biological treatment, *Sewage treatment, Aeration, Tanks, Reservoirs, Water reuse. Identifiers: Municipal-industrial wastes.

A patent was issued for a method of waste water purification in which only the most contaminated part of the effluent is treated. Surface waste water from populated and industrial areas was collected. The water received during the first 20 to 30 minutes (the most heavily contaminated) was separated for biological treatment with municipal sewage in an aeration tank. The remaining water was aerated in a periodically emptied tank. In one case, the initial amount of waste water was allowed to settle before being mixed with municipal water for biological purification. The remaining collected surface waste water was aerated in the presence of activator or treated waste water from the first portion. Following disinfection, the water could be reused for industrial or domestic pur-poses. (Kramer-FIRL) W76-01432

Group 5D-Waste Treatment Processes

PROCESS AND APPARATUS FOR TREATING WASTES BY A COMBINED ACTIVATED SLUDGE AND BIOLOGICAL FILTER BED, J. Tymoszczuk.

Canadian Patent 972,877. Issued August 12, 1975. Patent Office Record, Vol 103, No 32, p 84, August, 1975.

Descriptors: *Patents, *Activated sludge, *Filters, *Waste water treatment, Sewage treatment, Biological treatment, Equipment, Filtration. Identifiers: *Biological filters.

A patent has been granted to a process and equipment for treating wastes by a combined activated sludge and biological filter bed. Sewage is treated in a tank containing the means to maintain a submerged biological filter bed zone containing finely divided, particulate filter media. The tank further contains equipment to maintain an activated sludge zone in the tank in an upstream fluid flow relationship to the submerged biological filter bed zone. Baffles divide the tank into several compartments. These baffles extend through the activated sludge zone and partially into the biological filter bed zone. When the apparatus is in use, the finely divided particulate filter media can be recirculated and backwashed and the activated sludge zone aerated. Sewage is fed into the first compartment and treated effluent is removed from the activated sludge zone of the last compartment. (Kramer-FIRL.)

CONTINUOUS FILTRATION APPARATUS FOR SEWAGE.

French Patent FR 2247-270. Issued June 13, 1975. Derwent French Patents Abstracts, Vol W, No 29, p D2-D3, August, 1975.

Descriptors: *Patents, *Filtration, *Sewage treatment, Tanks, *Waste water treatment, Pumps, Equipment, Filters, Separation techniques. Identifiers: Continuous filtration.

A cylindrical filter tank, covered with a filtering fabric, is arranged in a reservoir. In this patented method, sewage enters the chamber of the reservoir through an inlet pipe. A cylindrical supporting plate surrounds the filtration tank, and another cylindrical support plate is arranged inside the chamber. Sewage water flows up the passage and through the filter into the space. Air enters through openings and generates a flow of bubbles; this produces a pressure difference between the fluid containing bubbles and the fluid without bubbles. The pressure difference removes the solid matter adhering to the filtering fabric and prevents clogging. An overflow pipe then receives the filtered water. Any small particles which past through the filter are evacuated from the conical portion by an air pump. Concentrated solid matter and residue from the sewage is evacuated for further treatment. Because the flow of bubbles prevents any blocking of the filter fabric, removal of the suspended solid matter is efficient and continuous filtration is possible. (Kramer-FIRL)

WASTE WATER AND SEWAGE PURIFICA-TION APPARATUS.

Belgian Patent BE 825-764. Issued June 16, 1975. Derwent Belgian Patents Report, Vol W, No 28, p D3, August, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Activated sludge, Biological treatment, Aeration, Sedimentation. Identifiers: *Chemical treatment.

An apparatus for treating waste water and sewage which can be installed inside an aeration tank was patented. It operates either by the activated sludge process or by chemical purification with air or an oxidizing gas. A flat supporting surface carries the air feeding device and a discharge gutter. The

latter is parallel or vertical with respect to the support, depending upon whether the shape of the tank is rectangular or cylindrical. The air feed consists of an extensible tube provided with porous aerators. Air is received which sufficiently aerates the contents of an activation zone and recycles any settled sludge out of a reclarification zone. At the same time, floating sludge is evacuated from the surface of the latter zone. The gutter has a terminal oblique plate, which is swept by the air leaving the inlet device so that a suction effect is created to draw the floating sludge from the reclarification zone to the activation zone. This equipment is particularly suitable for small sewage treatment plants with tanks made of metal, plastic, asbestos cement, or concrete. (Kramer-FIRL)

THE UNOX PROCESS-AN EXTENSIVE EXPERIMENT FOR THE BIOLOGICAL PURIFICATION WITH PURE OXYGEN- MUNICIPAL WATER PURIFICATION MUNICH (DAS UNOX VERFAHREN--EIN GROSSVERSUCH ZUR BIOLOGISCHEN ABWASSERREINIGUNG MIT REINEM SAUERSTOFF--STADWAESSERUNG MUENCHEN).

P. Martin, H. Schoenfelder, and W. Tischer. Gas-und Wasserfach-Wasser/Abwasser, Vol 116, No 6, p 272-277, 1975. 7 fig, 1 tab.

Descriptors: *Biological treatment, *Waste water treatment, *Municipal wastes, Industrial wastes, Effluents, Oxygen. Identifiers: *High purity oxygen, *UNOX, Municipal-industrial wastes.

Extensive experiments with the UNOX system developed by Union Carbide for biological waste water treatment are described. The waste water used for the experiments was comprised of 60% domestic effluents with 40% effluents generated in food processing industries. The UNOX system is composed of closed reactors arranged in four stages, in which biological purification is achieved by the admission of air containing at least 95% oxygen. The purified effluent was of better quality than similar effluents treated by conventional methods for the same time period. The process was noted for its high stability with respect to load fluctuations, and a reduced production of excess sludge and solid matter. The UNOX system also offers hygienic advantages due to a reduction in air pollutant emissions. (Takacs-FIRL)

DEVELOPMENT OF THE DEEP AERATION

TANK, (IN JAPANESE), H. K. Fujii, K. Terasawa, I. Naito, and T. Takeshima.

Gesuido Kyokaishi, (Journal of Japan Sewage Works Association), Vol 12, No 133, p 43-52, June, 1975. 6 fig, 6 tab, 6 ref.

Descriptors: "Aeration, "Tanks, "Suspended solids, "Waste water treatment, Gas chromatography, Activated sludge, Flotation. Identifiers: "Deep aeration tanks.

A deep aeration tank with an aeration depth of 18 m was compared with one having an aeration depth of 4.2 m. An inner 1.0 m in diameter was used for liquid circulation for the latter case utilizing an air lift effect. The post aeration tanks consisted of four basins having an aeration depth of 4.5 m (water depth 5 m). Mixed liquid was sampled in glass cylinders after one hour of aeration and the liquid was allowed to stand for various periods of time. At an aeration depth of 4.2 m, the activated sludge in the mixed liquid settled almost completely after 30 minutes while at an aeration depth of 18 m, the activated floated during the same period of time. The rate of floation depended upon the quantities of activated sludge and air. Gases adsorbed on the floating sludge were analyzed by gas chromatography with a thermal conductivity detector. The gases contained up to

94% nitrogen. Good results were obtained at an aeration depth of 4.2 m for a BOD load of up to 100 kg/100 kg suspended solids per day. (Su-FIRL) W76-01437

DEVELOPMENT AND USE OF FLOATING FIL-TERING MATERIALS IN WATER FILTRA-TION (RAZRABOTKA I VNEDRENIE PLAVAYUSHCHIKH ZAGRUZOK FIL'TROVANIYA VODY), For primary bibliographic entry see Field 5F. W76-01438

CENTRIFUGING PLANT IN THE PURIFICA-TION PLANT MUNICH-GROSSLAPPE (ZENTRIFUGENLAGE IM KLAERWERK MUENCHEN-GROSSLAPPEN), W Tischer

W. lischer. Abwassertechnik, Vol 26, No 3, p 23-24, 1975. 1 fig. 1 tab.

Descriptors: *Centrifugation, *Dewatering, *Sludge treatment, *Waste water treatment, Treatment facilities, Polymers, Flocculation, Sludge disposal, Waste disposal. Identifiers: Munich(Germany).

Full-scale experiments with a large-capacity Kliocckner-Humboldt-Deutz centrifuge used for sludge dewatering at the Grosslappen waste water treatment plant near Munich, Germany, are described. The existing digestors cannot cope with the 200 tons of primary and secondary sludge that are being generated daily. The demand for agricultural use of the sludge has decreased and the use of centrifuges for dewatering is a viable alternative to land application. With centrifugation, the dry matter content is increased from 3-10% to 20-30%. The water separated has a BOD5 level of 100-300 mg/liter. Flocculating polymers may be added directly into the centriguge. (Takacs-FIRL)

PURIFICATION OF URBAN WASTEWATERS BY ALKALINE PHYSICO-CHEMICAL TREAT-MENT (L'EPURATION DES EAUX RESIDUAIRES URBAINES PAR TRAITEMENT PHYSICO-CHIMIQUE ALCALIN), D. Alexandre.

Techniques et Sciences Municipales--L'Eau, No 6, p 239-247, 1975. 1 fig, 11 tab, 6 ref.

Descriptors: *Waste water treatment, *Municipal wastes, Flocculation, Biochemical oxygen demand, Chemical oxygen demand, Operating costs, Capital costs, Waste disposal.

Identifiers: *Physico-chemical treatment, Aluminum sulfate, Ferric chloride, Slaked lime, Polyacrylamide A22, Land application.

Alkaline physico-chemical waste water treatment and its advantages are described. Flocculation and subsequent clarification can be used as an autonomous process in place of biological waste water treatment. Flocculation is conducted at a pH of 11.5 in the presence of ferric chloride, aluminum sulfate, slaked lime, or polyelectrolytes. Aluminum sulfate, slaked lime, or polyelectrolytes. Aluminum sulfate, ferric chloride, slaked lime, polyacrylamide A22 (Purifloc), and powdered activated charcoal Acticarbone TE are used at rates of 20 g/liter, 10 g/liter, 15 g/liter, one g/liter, and 10 g/liter, respectively. The floccules obtained can be easily separated by decantation, and the dense sludge obtained can be disposed of onto landfills. The physico-chemical method is not inferior to biological methods in terms of BOD and COD reduction, and is even superior to the latter regarding disinfection and phosphate elimination. Physico-chemical treatment, requiring lower investment but higher operating costs than a biological system offers the advantage of increased insensitivity to seasonal climatic and load variations. (Takacs-FIRL

SEWAGE LAGOONS FOR FINAL TREAT-MENT, EXEMPLIFIED BY BAD HARZBURG (NACHLAERTEICHE ZUR WEITERGEHEN-DEN ABWASSERREINIGUNG-DARGESTELLT AM BEISPIEL BAD HARZBURG),

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K. Zander. Wasser und Boden, Vol 27, No 5, p 119-121, May. 1975. 2 fig, 2 tab, 3 ref.

Descriptors: *Lagoons, *Sewage treatment, *Biological treatment, *Waste water treatment, Chemical oxygen demand, Biochemical oxygen

Identifiers: Post-treatment lagoons, Sewage load fluctuations, Seasonal variations, Germany.

Operating experiences with sewage lagoons fol-lowing biological waste water treatment at a facili-ty in Bad Harzburg, West Germany, are presented. Four series-connected post-treatment lagoons with a total surface area of 23,000 sq m are necessary to handle wide fluctuations in the sewage load, which are a result of snowwater in-flux in the winter and an increase in the seasonal visitor population in the summer months. Water depth is adjustable between zero and 100 cm, and sewage has a residence time of one day in each lagoon. The lagoons were found to increase the ef-ficiency of the entire biological waste water treatment plant from 97% in terms of BOD5 reduction. Potassium permanganate demand decreased from 58 to 48 mg/liter through the consecutive lagoons. COD values showed a reduction from 39 to 23 mg/liter, corresponding to a 40% reduction. The efficiency of the post-treatment lagoons in terms of nitrogen and phosphorus elimination amounted to 17% and 10%, respectively. The coli titer was reduced by 99%, and the lagoons had a healthy fish population. (Takacs-FIRL)
W76-01441

EXPERIENCE WITH THE DETERMINATION OF THE BIOCHEMICAL OXYGEN DEMAND WITH SPECIAL CONSIDERATION OF THE MODIFIED 'VIEHL DILUTION METHOD, CERFAHRUNGEN MIT DER BESTIMMUNG DES BIOCHEMISCHEN SAUERSTOFFEBE-DARFS UNTER BESONDERER DARFS UNTER BESONDERER
BERUECKSIGHTIGUNG DER MODIFIZIERTEN VIEHL 'SCHEN VERDUENNUNG-TEN VIEHL SMETHODE),

S. Bochmke.
Das Papier, Vol 29, No 8, p 358-362, August, 1975.
2 fig, 1 tab, 18 ref.

Descriptors: *Biochemical oxygen demand, *Waste water treatment, *Analytical techniques, Microorganisms, Oxygen, *Pollutant identifica-Identifiers: *Viehl's Method.

An improved variation of Viehl's method for the determination of the biochemical oxygen demand (BOD) in waste waters is described. A water sample which contains adapted microorganisms and nutrient salts is enriched with oxygen to a concentration of 20 mg/liter rather than to 35 mg/liter. A nitrification inhibitor (N-allylthiourea) is added at a rate of 0.6 mg/liter. The determination and calcuation are simplified by the use of a special 100 ml-flask. Frequently occuring errors that result from the dilution effect can be avoided if the oxygen consumption used for the BOD calculation is between 30 and 70% of the original oxygen content. (Takacs-FIRL) W76-01442

COMPARATIVE STUDY OF POLIOVIRUS CONCENTRATION METHODS FROM WATER (ESSAIS COMPARATIVES DE METHODES DE CONCENTRATION DU POLIOVIRUS APARTIR DES EAUX), C. Gulian, M. N. Mallet, A Blancard, and J.

Charrel.

Techniques et Sciences Municipales--L'Eau, No 5, p 205-208, May, 1975. 4 tab, 8 ref.

Descriptors: *Pollutant identification, *Filtration, Viruses, Organic matter, Hydrogen ion concentra-tion, Polyelectrolytes, Separation techniques, *Waste water treatment. Identifiers: *Poliovirus.

Two methods for the separation of poliovirus from Two methods for the separation of poliovirus from different waste were studied. Filtration through a cellulose filter showed efficiencies of over 90% for waste waters with low organic matter content. However, very low efficiency was achieved for waste waters with a high content of organic substances. Adsorption of a polyelectrolyte PE 60 (polystyrene-divinylbenzene with an sobutylene maleic anhydride group) proved to be highly effective with efficiencies between 90 and 100% regardless of the organic matter content of the waste gardless of the organic matter content of the waste water. However, this method requires a pH value of 5.2. Slight deviations from this pH value result in considerable reduction of the separation effi-ciency. (Takacs-FIRL) W76-01444

THE MEASUREMENT OF MLSS USING INTEGRATED SPHERICAL TYPE TURBIDIME-

TER, (IN JAPANESE),
For primary bibliographic entry see Field 5A.
W76-01445

PHOSPHATE DEPENDENT FLOCCULANT DOSAGE AT PHOSPHORUS ELIMINATION FROM COMMUNAL WASTE WATER (DIE PHOSPHATFRACHT-ABHAENGIGE FAELIMITTEL-DOSIERUNG PHOSPHOR-ELIMINATION AUS KOMMU-NALEM ABWASSER), H. Zerres, and R. Wagner.

Chemie Ingenieur Technik, Vol 47, No 13, p 562-565, 1975. 5 fig, 4 ref.

Descriptors: *Flocculation, *Phosphates, *Waste water treatment, *Nutrient removal, Measurement, Flow, Treatment facilities, Photometry, Pollutant identification. Identifiers: Flocculant dosage, Phosphate

A method for determining phosphate load-dependent dosage of floculants for phosphorus removal from municipal waste water is described. The dosage is dependent on the fluctuations in the phosphate load of the waste water. This method is based upon the continuous photometric measurement of the phosphorus concentration in the waste water by a molybdate-vanadate method, and on the measurement of the waste water flow. The signal obtained is used to control the rotation speed of the flocculant proportioning unit, and thus to determine the actual phosphate load. This method has been successfully tested a a waste water treatment plant. (Takacs-FIRL) W76-01446

STUDY OF THE RELATIONSHIP BETWEEN EFFICACY OF PURIFICATION AND CONSTRUCTION AND OPERATING COSTS OF PU-RIFICATION PLANTS (UNTERSUCHUNG UEBER DIE BEZIEHUNG ZWISCHEN RENINGUNGSGRAD UND BAU UND BETRIEB-GUNGSGRAD UND BAU UND SKOSTEN VON KALERANLAGEN),

G. Heberling, and H. Hahn. Gas-und Wasserfach-Wasser/Abwasser, Vol 116, No 5, p 206-208, May, 1975. 5 fig, 14 ref.

Descriptors: *Waste water treatment, *Operating costs, *Construction costs, *Treatment facilities, Mathematical models, Biochemical oxygen demand, Regression analysis. Identifiers: *Germany.

Correlations between waste water purification ef-ficiency and the construction and operating costs of waste water treatment plants were investigated. Regression analysis was performed on the basis of data from 179 waste water treatment plants put

into operation between 1955 and 1972 in West Germany and elsewhere. The regression analysis showed no significant correlation between predetermined purification efficiency goal and the construction and operating costs for new waste water treatment plants. However, a close correlawater treatment plants. However, a close correlation was found between the expenditures and the population equivalents to be connected to the waste water treatment plant. This correlation, in conjunction with the finding that 84% of the waste water treatment plants reached BOD5 elimination efficiencies over 80%, permits the establishment of universally applicable mathematical models. (Takacs-FiRL) W76-01448

THE FORECASTING, OF INFLOW VARIATION INTO THE WASTE WATER TREATMENT FACILITY IN THE NEW TOWN, (IN JAPANESE), M. Hiraoka, T. Murakami, O. Yamamoto, and Y.

Yosui to Haisui, (Journal of Water and Waste), Vol 17, No 7, p 849-853, 1975. 8 fig, 5 tab, 4 ref.

Descriptors: *Waste water treatment, *Treatment facilities, Water supply, Inflow, Mathematical models, Flow, Forecasting.
Identifiers: *Japan, Inflow variation, Regional forecasting.

Variation of inflow of waste water to a treatment plant at Izumi Kita, Japan, was forecasted by a re-gional system. The relationship between water supply and waste water was investigated in order supply and waste water was investigated in order to control the waste water variation by water supply variation. Water supply and waste water showed a similar daily flow pattern; waste water had its daily peaks at 9-10 am and after 10 pm. Variation of water supply was extremely broad with a maximum supply of 2,000-2,500 cu m/h and a minimum of 200 cu m/h. Except for one case, water supply flow was considerably higher than waste water. This was due to the conservation in the activity system and transfer to outside of the the activity system and transfer to outside of the the activity system and transfer to outside of the cor-regional system. Results of investigating the cor-relation coefficient between water supply varia-tion and waste water variation suggested effective forecasting of inflow waste water variation by water supply variation corresponding to a lag time of about one hour. (Su-FIRL) W76-01449

EVOLUTION OF OPERATION CONTROL IN WATER TREATMENT (A VIZTISZTITASI TECHNOLOGIAK UZEMIRANYITASANAK FEJLODESE),

J. Kerese. Hidrologiai Kozlony, Vol 55, No 6, p 266-272, June, 1975. 3 fig.

Descriptors: *Waste water treatment, *Waste treatment, *Computers, *Control systems, *Automation, Filters, Data collection.
Identifiers: Hungary, Melyepterv.

Automatic control systems for water treatment in Hungary, under the auspices of the Melyepterv Corporation, are outlined. Equipment is used to process the signals given and to measure data for the control of the flushing of closed drum filters, the backwashing and filter operation of open and closed sand filters, and the rate of chemical feed closed sand filters, and the rate of chemical feed combined with automatic tank switchover and actuated by flow rates. Pumping stations have been equipPed with constant and variable speed pumps to deliver raw and treated water. Methods adapted for data collection, display, and recording at a central control station are detailed, along with the capabilities of the decision unit and its relationships to the control technology. (Kramer-FIRL) W76-01450

MATHEMATICAL MODEL OF WATER CHARACTERISTICS IN THE SEWAGE TREAT-

Group 5D—Waste Treatment Processes

MENT PLANT (GESUI SHORIJO NI OKERU SUISHITSU TOKUSEI NO SUSHIKI MODEL), T. Kuzuoka, and O. Hitomi.

Kemikaru Enjiniyaringu, (Chemical Engineering), Vol 20, No 6, p 32-38, June, 1975. 7 fig, 2 tab, 19 ref.

Descriptors: *Mathematical models, *Sewage treatment, *Activated sludge, Aeration, Microorganisms, Water quality control, Suspended solids, Treatment facilities, Flow rates.

Identifiers: Material balance equations, Voshel equation.

Mathematical models for sewage treatment by an activated sludge method are illustrated. The method generally consists of initial sedimentation, aeration, and final sedimentation. Water quality from the initial sedimentation can be obtained by a simple Voshel equation. For an aeration basin, water quality is obtained by resolving material balance equations involving flow rates and reactivity of water, microorganisms, substrate, and the variations in microorganism activity. Corrections of equations by using a parameter for the decreasing rate of microorganisms cultivated in synethic sewage water were found suitable for most available equations for the aeration process. Water quality can be kept at a stable level by allowing microorganisms to remain in ther aeration tank for a constant period of time. Two equations used to calculate suspended solids values for the final sedimentation tanks at two water treatment plants from 1966 to 1969 gave satisfactory results. (Su-FIRL.)

CONTROL OF THE POLLUTION OF SURFACE WATER BODIES (BESTRIJDING VERONTREININGING OPPERVLAKTEWATER),

J. G. Wedorp.
Procestechniek, Vol 30, No 14, p 454-456, July, 1975.

Descriptors: *Water pollution control, *Public health, *Turbidity, Color, Odor, Surface waters, Aquatic life, Water treatment, Treatment facilities, Waste water treatment, Sewers, Sewerage, Water treatment(Applied). Identifiers: *Netherlands.

The water pollution control program elaborated by the Ministry of Transportation and Water Management and the Ministry of Public Health and Environmental Hygiene of the Netherlands for the 1975 to 1979 period is presented. The waste water treatment capacity is to be increased to 20,000,000 population equivalents by the construction of 118 waste water treatment facilities and by the expansion of 58 existing ones. The percentage of household not connected to sewer systems will be reduced to 8%. Absence of odor, color, and turbidity are the minimum requirements for the water quality to be achieved within the five-year period. Also, any surface water body should be made suitable as a living environment for aerobic organisms, including fish. Water treatment fees to be paid will be determined as a function of transportation distance, capacity of the water treatment facility, soil conditions, and population density. (Takacs-FIRL)

FORCE MAIN RUNS OBSTACLE COURSE.
Public Works, Vol 106, No 9, p 117, September,

Descriptors: *Sewerage, *Sewers, Tunneling, Pipelines, Conduits, Steel pipes, Construction, Pumping plants.

dentifiers: *Force mains.

The construction of a force main to connect the 126th Street bus depot in Corona, Queens, to the New York City sewer system involved tunnelling under 16 active railroad tracks operated by two

different companies, a railroad station, a creek, and two 13,000-volt feeder cables. A boring machine was used to drill 180 feet north to the bus depot and 220 feet south to the sewer. Depending on the type of materials encountered by the machine, progress ranged from 1-2t/day to 30 ft/day. Twenty foot long sections of 30 inch steel pipe were forced ahead of the boring machine and joined to form a conduit for the 8 inch ductile cast iron main. The conduit is sized to be able to handle additional lines if needed in the future. After completion of the conduit and placement of the cast iron main inside, the main was attached to the cast iron main stack-welded by a man who crawled through the narrow tunnel with a supply of steel straps and welding equipment. It required five days to place 40 straps. A pump house constructed next to the bus depot provides the force necessary to move sewage through the main. The pump house contains an electrically operated duplex, vertical, submerged sewage ejector controlled by a transistorized, alternating pump panel housed in this building. (Orr-FIRL)

MIAMI SEWER PLAN TAKES THE POSITIVE APPROACH.

Miami City, Dept. of Public Works, Fla. J. J. Kay.

Water and Wastes Engineering, Vol 12, No 9, p 31-34, 36, September, 1975. 2 fig, 2 tab.

Descriptors: "Sewers, "Waste water treatment, "Sewage treatment, Florida, Construction materials, Design criteria, Pipelines, Joints(Connections), Infiltration, Installation, Flow rates.

Mami(Fla).

The city of Miami, Florida, has been implementing a program to provide new sanitary sewer systems and to upgrade its existing sewers. Combined sewer systems are not desirable as they place too severe a load on the sewage treatment plant during high intensity rain storms, and have very high pumping requirements and maintenance costs. Installation of sanitary sewers in South Florida depends on soil conditions, groundwater elevation, and depth of cut. In many cases, an apparatus called a 'mule' is needed in sewer construction at moderately deep cut ranges where trench sidewalls have become unstable. When a large and deep trunk line is required, a 'piggyback' system is utilized, in which a minimum 8-inch diameter pipe is laid in the same trench and above the larger trunk line. Criteria for design of sanitary sewers include population density, groundwater infiltration, a minimum velocity of 2 feet per second, and an average daily flow of 65 gallons per capita per day. Infiltration problems may be al-leviated with the specification that new joints for clay pipe and fittings will be factory bonded joints. Tests for leakage are performed before the acceptance of installation of new sanitary sewers. Replacement of 50 year old concrete pipes with vitrified clay pipe is also being done when major redevelopment within the public right-of-way occurs. (Kramer-FIRL) W76-01456

SEWER LINE INFILTRATION PROBLEM SOLVED.

Consulting Engineer, Vol 45, No 3, p 96, 98, September, 1975. 4 fig.

Descriptors: *Sewers, *Infiltration, *Pipelines, Equipment, Joints(Connections), Monitoring, Control systems, Remote sensing, Interceptor sewers, Polymers, Repair, Rehabilitation.

Identifiers: *Television inspection, Grouting material.

Repair of an interceptor line laid along a lake shore in Fayetteville, North Carolina, is described. Because the eight-foot sections of concrete pipe had been laid in gravel bedding in water-bearing sand, infiltration was a severe problem. Two thirds of the line had been installed below the lake level, and a continuous pressure existed on rubber compression gaskets and joints which could not be reduced by cement collars on the joints or by gel grouting. The infiltration problem was solved, however, with a system employing closed circuit television and an inflatable sleeve packer. The television camera was pulled through the sewer pipe, with the packer following. The packer was then positioned visually, inflated, and filled with a metered amount of 3M Elastomeric Sewer Grouting Compound and water. The grouting material was released and compacted under pressure and expanded up to ten times to fill the area with a flexible seal. Six months following this rehabilitation treatment, weir measurements were made to determine flow rates, and it was determined that the repair effort was successful. (Kramer-FIRL) W76-01457

GROUTING STOPS INFILTRATION IN LARGE-DIAMETER STROM DRAIN. Public Works, Vol 106, No 9, p 82, September,

Public Works, Vol 106, No 9, p 82, September 1975.

Descriptors: *Infiltration, *Polymers, *Sewers, *Rehabilitation, Storm drains, Construction materials, Joints(Connection), Repairing, Pipelines, *Grouting, Louisiana.
Identifiers: Grouting material, Lake Charles(La).

Infiltration into storm sewers has been prevented by a pipe rehabilitation system, applied to Lake Charles, Louisiana, Because the sewer lines were installed about fifteen years ago directly into water-bearing sand, water and sand infiltration have been a serious problem and shifting of the line's four-foot concrete sections has cracked the masonry grout in the joints. A permanent repair method was implemented, using a new hydrophilic polymer grouting material. The system requires a three-man crew and employs a group application probe, a three element inflatable packer, and 3M's Elastomeric Sewer Grouting Compound. A faulty joint may be rehabilitated by manually positioning the packer inside the pipe barrel, holding the probe at the application point, and inflating the packer's two end elements to isolate the repair area. The grouting compound is then metered and mixed with water, and injected under pressure into the space between the packer's end elements. The center element is then inflated and compacts the compound into the joint. Because the grouting compound is a low viscosity liquid which expands up to ten times, the joint is filled with a tough but flexible seal within three minutes. After one year of rehabilitation, the system was found to still be preventing infiltration. (Kramer-FIRL) W76-01458

STEEL SELECTED FOR TIGHT EFFLUENT LINE,

Warren and Van Praag, Inc., Decatur, Ill. For primary bibliographic entry see Field 8G. W76-01459

SUBMERSIBLE LIFT STATIONS CUT PUMP MAINTENANCE COSTS. For primary bibliographic entry see Field 8C. W76-01460

SEWER INSERTION RENEWAL SAVES TOWN \$2.5 MILLION,

\$2.5 MILLION,
For primary bibliographic entry see Field 8G.
W76-01461

SAM: A SEWER SYSTEM MODEL FOR PUBLIC WORKS ENGINEERS, CH2M/Hill, Corvallis, Oreg.

CH2M/Hill, Corvallis, Oreg.
A.L. Davis, and W. G. O'Neel.
Public Works, Vol 106, No 10, p 78-79, 120, October, 1975, 1 tab, 2 ref.

Descriptors: *Computers, *Model studies, *Sewer systems, Design criteria, Infiltration, Storm runoff, Manholes, Flow rates, Pipelines, Simulation analysis, Oregon. Identifiers: Portland(Ore), System Analysis Model(SAM)

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A System Analysis Model (SAM) for the city of Portland, Oregon, has been designed. This com-puter model simulates the overloading of the city's combined storm and sanitary sewer system in order to determine where overloading would have occurred and to determine the best route of waste water through the city's sewer system. The model arrives at its conclusion by developing hydro-graphs and hydraulic gradelines for sewer nodes graphs and hydraulic gradelines for sewer nodes (usually manholes), by calculating sewage flow from all sources, particularly from storm runoff, and by mathematically routing the sewage through the system. SAM is also used by engineers to keep an inventory of pipe size, length and condition, manhole volume and condition, and to keep maintenance information of all the components. It also tenance information of all the components. It also has applications in sewer design and sewer system analysis. The SAM is compatible with the Portland IBM 1130 computer, and can be used for a small amount of initial data, offering the flexibility of changing data later. The model was designed in four separate routines to permit its use with the small capacity computer. The modules are storm uponformations infiltration. runoff, sanitary sewage contributions, infiltration and inflow, and routed flow in the sewers. Existing quality routines can be expanded, and SAM can estimate the pollution impact of storm overflow. The model can also be linked to another one called nne model can also be linked to another one called DEAP, which designs, estimates the costs of, and plots new sewer lines. The ultimate usage of SAM is system control, which has been tested in the municipality of Metropolitan Seattle. (Kramer-FIRL) W76-01463

TREATING SEWAGE.

Australian Patent 461,647. Issued June 5, 1975. Official Journal of Patents, Trade Marks and Designs, Vol 45, No 19, p 2112, June, 1975.

Descriptors: *Patents, *Sewage treatment, *Separation techniques, Equipment, Waste water treatment, Aeration, Organic matter, Tanks.

A method was patented for the removal of solids from liquid sewage. A tank is described, with a floor which ends in an accumulation zone for solids, parallel to and adjacent to a first side wall. Sewage is passed into the tank, and uniformly dis-tributed along the first side wall which is posi-tioned transverse to the direction of flow. Air is introduced into the sewage adjacent to the first side wall and above the accumulation zone. Thus, liluid containing light organic matter and light particles of grit of a specific gravity greater than the organic matter is forced to flow upward toward a second side wall, opposite the first wall. The wall interrupts the flow and directs it downward to the tank floor by a baffle positioned adjacent to the second wall. At least part of the sewage is passed second wall. At least part of the sewage is passed under the baffle and upward between the baffle and the second side wall where it is removed by flow over a weir which extends the full length of the second side wall. (Kramer-FIRL) W76-01464

STUDIES ON THE ACTIVITY OF A SODIUM HYPOCHLORITE SOLUTION ON VIBRIO CHOLERAE BIOTYPE ET TOR FOR DRINK-ING WATER STERILIZATION,

Dakar Univ. (Senegal). Faculty of Medicine and

R. Baylet, and S. Diop. Bull Soc Pathol Exot. Vol 65, No 1, p 25-30. 1972. (English Summary).

Descriptors: *Potable water, *Water purification, Human diseases, Diseases. dentifiers: Chlorite, *Cholera, *Sodium hypochlorite, Tor, Vibrio-Eltor, Water.

Optimal conditions were defined for sterilization of chloera polluted drinking water by a sodium hypochlorite solution.—Copyright 1974, Biological Abstracts, Inc. W76-01465

METHOD AND APPARATUS FOR PURIFYING WASTE WATERS AND SEPARATING SLUDGE,

Canadian Patent 973,830. Issued September 2, 1975. Patent Office Record, Vol 103, No 35, p 39, September, 1975.

Descriptors: *Patents, *Waste water treatment, *Separation techniques, Sludge treatment, Effluents, Ozone,

A patent was issued for the treatment of waste water and the separation of sludge. The effluent liquid is formed into droplets in an ozone containing atmosphere. Suspended material in the water is removed by electrolyzing the water. Hydrogen gas bubbles are thereby produced, which rise to the surface of the water, carrying the suspended material to form floating sludge. The sludge is removed, leaving clarified water. (Kramer-FIRL) W76-01466

QUICK RELEASE SAFETY TRAP, For primary bibliographic entry see Field 8C. W76-01467

WASTE TREATMENT APPARATUS.

L. R. Rosenberg.
United States Patent 3,904,525. Issued September 9, 1975. Official Gazette of the United States Patent Office, Vol 939, No 2, p 768, September, 1975. 1 fig.

Descriptors: *Patents, *Biological treatment, *Waste water treatment, Equipment, Microorganisms.

Identifiers: Biological reactors.

A patent for a biological reactor for waste treat-ment has been issued. Biological mass growing media is attached to the rotor of a rotating biologi cal reactor. The media consist of a group of wedge-shaped elements, each having opposite planar major surfaces. Each of these surfaces has a pattern of protrusions and depressions, and in-clude coacting projections and receptacles which serve as spacers to keep the elements apart from one another. Alignment means includes pockets in each of the elements and latches whereby pockets of one element align and cooperate for engage-ment with latches in an adjacent element. (Kramer-FIRL)

ON THE MINIMUM SIZE OF NATURAL-DRAFT DRY COOLING TOWERS FOR LARGE POWER PLANTS,

Cornell Univ., Ithaca, N.Y. Energy Project. For primary bibliographic entry see Field 8A. W76-01488

SCALING LAW FOR DRY COOLING TOWERS WITH COMBINED MECHANICAL AND NATU-RAL DRAFT.

Cornell Univ., Ithaca, N.Y. Energy Project. For primary bibliographic entry see Field 8A. W76-01490

5E. Ultimate Disposal Of Wastes

PHOSPHORUS IN THE RURAL ECOSYSTEM--RUNOFF FROM AGRICULTURAL LAND, Wisconsin Univ., Madison. For primary bibliographic entry see Field 5B. W76-01017

THE ROLE OF THE WISCONSIN DEPARTMENT OF AGRICULTURE IN AGRICULTURAL POLLUTION PREVENTION AND CON-

TROL, Wisconsin Dept. of Agricultural, Madison. D. E. Wilkinson

In: Proceedings of Conference on Farm Animal Wastes, Nitrates and Phosphates, in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, February 1-5, 1971, p 119-

Descriptors: *Wisconsin, *Environment, *Farm wastes, Regulation, Legal aspects, Waste disposal, Management, Control. Identifiers: *Agricultural pollution, *Pollution control

Donald Wilkinson, Secretary, Wisconsin Department of Agricultural, is optimistic about the prospects of developing a quality environment, one in which there is a high degree of compatibility between the ecological and economic community. There is an ever-increasing problem of cohabitation. The important part of this human-animal relationship is waste disposal and a clean environment. Since the total farm income in Wisconsin exceeds 1.6 billion dollars and since the livestock inceeds 1.6 billion dollars and since the livestock in-dustry produces about 86 percent of this total, animal waste disposal is very important. The Department of Agricultural is concerned with many other types of wastes as well. Wilkinson stresses that it is foolish to think that environmental polluthat it is foolish to think that environmental pollution can be managed by assigning agricultural waste and pollution to farmers, industrial pollution to industrialists and other types of wastes to the public in general. He feels that environmental problems will be solved only by integrated effort and coordinated management of resources at the rural-urban interface. (Cameron-East Central Oklahoma State)
W76-01018

SOIL POLLUTANTS AND THEIR EFFECTS ON

CLEAN WATER,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 5C. W76-01020

FARM POLLUTION: HOW REGULATIONS AF-FECT YOU.

For primary bibliographic entry see Field 6E. W76-01022

ENVIRONMENTAL, ECONOMIC, AND PHYSICAL CONSIDERATIONS IN LIQUID HANDLING OF DAIRY CATTLE MANURE,

New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.

O. L. Casler, and E. L. LaDue.
New York's Food and Life Sciences Bulletin
(Social Sciences: Agricultural Economics, No 1), No 20, 23 p. October, 1972, 10 tab, 42 ref.

Descriptors: *Dairy industry, *Cattle, *Farm wastes, *Waste storage, *Waste treatment, *Waste disposal, *Liquid wastes, Odor, Runoff, Economics, Nutrients, Costs, Storage tanks, Oxidation lagoons, Water pollution sources, Agricultural runoff, Cost-Benefit analysis.

Identifiers: Land spreading, Slatted floors, Open nits Manure

The environmental, economic, and physical impli-cations of liquid manure handling for dairy cattle is considered. It was found that six months storage considered. It was found that six months storage of liquid manure for disposal in the spring is not always beneficial. Large quantities of manure spread in the spring just before a heavy rain may cause more stream pollution than small quantities spead daily during the winter. Also, odor is more offensive in the spring. An investment of \$27,000-\$37,000 would be required for a 100-cow liquid manure system with a six month storage capacity.

Group 5E-Ultimate Disposal Of Wastes

Labor savings and increased manure value offset only a small part of the annual costs of a liquid manure system. The total return to the farm operator will rarely offset the costs incurred. Even if all costs and benefits could be internalized to the farm level costs would usually exceed benefits. (Ballard-East Central Oklahoma State) W76-01023

FEEDLOT WASTE MANAGEMENT SYSTEMS, R. C. Albin

In: Proceedings of the 1970 Beef Cattle Conference, Texas Tech University Animal Science Department, Lubbock, and Texas Tech University Research Center, Pantex, October 29, 1970, p 8-

Descriptors: *Farm wastes, *Feed lots, Pollutants, Waste treatment, Waste disposal, Runoff, Aerobic conditions, Anaerobic conditions, Lagoons, Dehydration, Incineration, Recycling, Agricultural runoff, Farm management, Oxidation. Identifiers: *Waste management systems, Land spreading, Composting, Oxidation ditches

The rapid expansion of cattle feedlots in the U.S. created the problem of handling and disposing of a vast quantity of feedlot wastes. The chemical and pollutional characteristics of feedlot wastes vary. The type of ration, size of cattle, climate, feedlot surface, and moisture content are all important factors in developing a waste management system. Numerous handling and disposal systems such as anaerobic and aerobic systems, lagoons, composing, oxidation ditches, dehydration, incineration, and nutrient recycling are available. However, final disposal of feedlot waste has been on land in most instances. The Great Plains Agricultural Council report recommended that research efforts be intensified in the areas of air pollution, land disposal, pollution under feedyards, systems analvsis, complete economic evaluation of current alternatives for waste disposal, and socio-legal im-plications. (Dudley-East Central Oklahoma State) W76-01024

AVERT RUNOFF POLLUTION, For primary bibliographic entry see Field 5D. W76-01025

EXPERIENCE WITH A SPRAY-RUNOFF SYSTEM FOR TREATING BEEF CATTLE FEEDLOT RUNOFF. Kansas State Univ., Manhattan. Dept. of Agricul-

tural Engineering. For primary bibliographic entry see Field 5D. W76-01026

FEEDLOT POLLUTION,

Montana State Dept. of Health, Helena. Water Pollution Control Section. D. G. Willems.

Proceedings of the Annual Agricultural Seminar Montana Agriculture-Focus on Improv-ing the Environment, Great Falls, Montana, December 3-4, 1970, p 31-34.

Descriptors: *Feed lots, *Air pollution, *Water pollution sources, "Montana, "Regulation, "Legal aspects, "Permits, Waste disposal.

Identifiers: "Point source wastes, Land disposal.

The Montana water pollution control law prior to The Montana water pollution control law prior to 1970 is delineated. Its greatest effect was upon industry and municipalities because their point source wastes were easy to identify and treat. But agricultural pollution must be met as well. Confined animal feeding drainage may well be the largest point source discharge in terms of organic material. The purpose of the proposed 1970 confined animal feeding regulation in (1) to a charge in the control of the proposed 1970 confined animal feeding regulation in (1) to a charge in the control of the proposed 1970 confined animal feeding regulation in (1) to a charge in the control of the proposed 1970 confined animal feeding regulation in (1) to a charge in the proposed 1970 confined animal feeding regulation in (1) to a charge in the proposed 1970 confined animal feeding regulation in (1) to a charge in the proposed 1970 confined animal feeding regulation in (1) to a charge in the proposed 1970 confined animal feeding regulation in the proposed 1970 confined animal feeding regu fined animal feeding regulation is: (1) to see that feedlot operations are properly located with respect to municipalities and residential areas, and (2) to control air and water pollution problems.

The regulation would require new feedlots and expanding feedlots to secure a permit from the De-partment of Health as soon as the regulation is adopted. (Hisle-East Central Oklahoma State) W76-01027

GRASS-FILTER SYSTEMS-ANOTHER NEW RUNOFF CONTROL METHOD.
Feedlot Management, Vol 15, No 5, p 42, May,

Descriptors: *Waste treatment, *Waste disposal, *Runoff, *Control, *Farm wastes, *Fescues, Aerobic conditions, Lagoons, Feed lots, Kansas, Nutrients, Soil bacteria, Agricultural runoff. Identifie 7: *Grass filter systems

A fescue grass-filter system for absorbing and treating runoff is being tested at the 20,000 head Blackjack Feedyards, Inc. near Yates Center, Kansas. The system is based on fescue grass over which lagoon-collected runoff is sprayed irriga-tion-style. A buildup of soil bacteria which forms a mat on the ground digests the feedlot waste solids purifying the runoff. Mat depth must be kept at less than 1 inch at all times or the system will become anaerobic. Grass is necessary to hold the solids on the land so that the bacteria can multiply and digest the material. Fescue grass is a good choice for eastern Kansas because of its adaptability to heavy moisture. If winter icing problems and year round mat buildup can be combatted effectively, it is hoped that grass-filter systems will be an acceptable method of treating and disposing of runoff. (Cartmell-East Central Oklahoma State) W76-01028

AREA NEEDED FOR LAND DISPOSAL OF

BEEF AND SWINE WASTES, Iowa State Univ., Ames, North-Central Regional Extension Project. D. H. Vanderholm.

Cooperative Extension Service Publication Pm-552, Iowa State University, Ames, January, 1973, 2 p. 4 tab.

Descriptors: *Farm wastes, *Cattle, *Waste disposal, *Nitrogen, Phosphorus, Potassium, Formulation, Irrigation, Waste treatment, um, Formulation, Irrigation, Waste treatment, Management, Waste management, Lagoons, Mathematical analysis. Identifiers: *Land disposal, Oxidation ditches, Deep-pit storage, Anaerobic lagoons, Bedded con-

finement, Open lots, Manure.

Formulas were established to determine the areas required for land disposal of hog and cattle wastes. The formulas are based upon an estimated 120 pounds of nitrogen excreted per 1000 pound-cow and 18.25 pounds per 100 pound-hog, varying with ration, breed, and size of the animal. Nitrogen losses in treatment, storage, and handling have been established for six types of management systems to arrive at recommended disposal areas based upon 100 pound Nitrogen applications per acre. Corresponding P and K rates are given. Approximate nutrient content of various farm waste forms are given. (Frantz-East Central Oklahoma W76-01029

LIQUID MANURE MANAGEMENT FOR

Texas Agricultural Extension Service, College Station. B. R. Stewart, and J. M. Sweeten.

Agricultural Extension Service paper, June 15, 1972, 24 p, 2 fig, 5 tab, 5 ref.

Descriptors: *Liquid wastes, *Farm wastes, *Management, *Hogs, Waste storage, Waste treatment, Waste disposal, Legal aspects, Lagoons, Regulation, Runoff, Confinement pens, Rates of application, Nutrients, Irrigation, Agricultural runoff, Farm management.

Identifiers: *Manure, Land disposal, Storage pits, Slotted floors, Open pits.

Texas regulatory guidelines are stated which give minimum requirements for preventing water pollution from confined feeding operations. Treated or untreated wastes may not be discharged to water courses except under rare rainfall events; therefore, alternative measures must be used. For confinement operations, this may mean: (1) daily scraping and cleaning of wastes for lagoon or pit storage, followed by land disposal, (2) use of slatted floors for collecting animal wastes in storage pits, followed by land disposal, or (3) use of slatted floors for catching animal wastes in shallows. low under-floor pits which discharge continuously into an outside lagoon. Pasture and open lot opera-tions require solid waste management techniques, with the exception of having to catch rainfall ru-noff in retention ponds. Specific design and management requirements are given for liquid waste storage, treatment, and land disposal of swine wastes. (Marquard-East Central Oklahoma W76-01030

SOURCES AND FATE OF 'AVAILABLE' NITROGEN IN RURAL ECOSYSTEMS, Wisconsin Univ., Madison. For primary bibliographic entry see Field 5B. W76-01031

EVALUATION OF ANAEROBIC LAGOON TREATING SWINE WASTES, Mississippi State Univ., State College. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5D.
W76-01032

SOME PHYSICAL AND ECONOMIC ASPECTS OF WATER POLLUTION CONTROL FOR CAT-TLE FEEDLOT RUNOFF,

Texas Tech Univ., Lubbock.
T. R. Owens, D. Wells, W. Grub, R. C. Albin, and Typescript, N. D. 21 p. 9 tab.

Descriptors: "Water pollution, "Control, "Runoff, "Farm wastes, "Feed lots, "Cattle, "Economics, "Waste treatment, "Waste storage, "Waste disposal, Costs, Texas, Chemical properties, Irgation, Basins, Model studies, Rainfall, Evaporation, Performance, Agricultural runoff. Identifiers: Land disposal, Slotted floors, Manure, Playa lake disposal Playa lake disposal.

Quantitative and qualitative aspects of feedlot runoff are studied. Average concentrations of pollutants in feedlot runoff are determined. Collection basin designs were discussed as runoff control measures. Comparative operating and investment costs are approximated with limitations discussed. Open land disposal has been attempted but Open land disposal has been attempted but modified environmental feeding on slotted floors is recommended as an approach to the problem. Pros and cons of the latter are discussed. (Wetherill-East Central Oklahoma State) W76-01034

SLUDGE DISPOSAL: A CASE OF LIMITED AL-TERNATIVES For primary bibliographic entry see Field 5D. W76-01035

THEY'RE GETTING THE JUMP ON POLLU-TION CONTROLS, R. Graves, and C. Hartman. Hoard's Dairyman, Vol 119, No 12, p 768, June 25, 1974. 1 fig.

Descriptors: *Water pollution, *Control, *Confinement pens, *Farm wastes, *Runoff, *Diversion, Dairy industry, Waste storage, Livestock, Agricultural runoff.

Identifiers: Manure, Environmental Eve Project.

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Farmers in Lafayette County, Wisconsin, are demonstrating that they will respond to positive, sensible programs aimed at controlling pollution sensible programs aimed at controlling pollution and stream degradation from confinement livestock operations. With impetus provided by the county extension office and soil and water conservation district, many groups and agencies are involved in making the 'Environmental Eye' a community project. The idea behind this project began in the spring of 1972. An environmental eye is both a real thing and a 'gimmick'. Looking at a hillside farmstead as an eyeball, a diversion up hill from the buildings forms and evelsch A collection from the buildings forms and eyelash. A collection channel or diversion below the buildings completes the eye. These two diversions are important parts of any barnyard runoff control project. For most small yard situations, the diversion of water from above the barn prevents manure from being flushed or washed out of yards or storage areas. Rain falling directly on the yard will wash away little manure. This usually can be con-trolled by directing it away from streams or ditches to nearby pasture or cropland. If more control is necessary, a solids separation area, deten-tion pond, or both, can be added at the end of the collection channel. (Cartmell-East Central collection char

THE PROBLEM OF FARM ANIMAL WASTE DISPOSAL

Ohio State Univ., Columbus. Dept. of Agricultural Engineering. E. P. Taiganides.

Management of Farm Animal Wastes, Proceedings National Symposium on Animal Waste Management, American Society of Agricultural Engineers, Michigan State University, May 5-7, 1967, p 5-8, 1 tab, 10 ref.

Descriptors: *Farm wastes, *Waste disposal, *Livestock, *Poultry, *Confinement pens, Lagoons, Odor, Runoff, Water pollution, Costs, *Agricultural runoff.
Identifiers: *Animal wastes, Land application.

Animal wastes are one of the six sources of farm wastes whose management and disposal have become one of the most challenging problems of modern farming. The factors which cause and/or aggravate the animal waste disposal problem are properties of animal wastes, current methods of livestock and poultry production, expansion of urban centers into rural areas plus public awareness of the need for healthy and aesthetically pleasant environment, and inadequacy of present methods of manure handling and disposal. On the basis of population equivalence data reported by raiganides and Hazen (1966) the daily wastes from poultry, swine, and cattle alone are equivalent to 10 times the wastes of the human population of the United States. American animal producers seek waste disposal methods which have low labor requirements, reduce nuisance conditions, and im-prove sanitation. They are limited by lack of technical information and by the misconception technical information and by the misconception that they should be able to dispose of manure at no extra cost. This lack of both the basic and applied knowledge necessary for successful handling, treatment, and disposal of farm wastes makes research in this area a unique challenge. (Marquard-East Central Oklahoma State) W76-01037

MANURE WASTE PONDING STUDY, California State Water Resources Control Board, Sacramento. For primary bibliographic entry see Field 5D. W76-01038

RUNOFF CONTROL SYSTEMS CONCRETE DAIRY CATTLE YARDS, FOR Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences. For primary bibliographic entry see Field 5B. W76-01039

FIELD PERFORMANCE OF SELECTED BEEF FEEDLOT WASTE HANDLING SYSTEMS, Illinois Univ., Urbana-Champaign.

D. H. Vanderholm, J. C. Lorimor, and S. W.

Presented at 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974. Paper No 74-4015, 9 p, 5 fig, 2 tab, 2 ref.

Descriptors: *Cattle, *Farm wastes, *Management, *Feedlots, *Monitoring, *Waste storage, *Waste disposal, *Corn belt, Oxidation lagoons, Control.
Identifiers: *Pollution control, Holding ponds.

Four feedlots were selected as research and demonstration sites to study waste management alternatives in the Corn Belt. Two were unsurfaced open lots utilizing holding ponds. The other two were cold confinement slotted-floor barns, one with a conventional deep pit manure storage and one with an under-flood oxidation ditch system. No attempt was made to rate the systems relative to one another, but data and observations were intended to provide a basis for evaluating the systems individually and collectively. All of the systems individually and collectively. All of the systems described in this paper were adequate to meet current pollution control regulations when adequately sized and properly managed. (Cartmell-East Central Oklahoma State) W76-01040

A CHARACTERIZATION OF THE EFFLUENT FROM COMMERCIAL CATFISH PONDS, Purdue Univ., Lafayette, Ind. Dept. of Agricul-

tural Engineering. For primary bibliographic entry see Field 5A. W76-01041

BIOLOGICAL TREATMENT OF FEEDLOT RUNOFF FOLLOWING SETTLING,
Purdue Univ., Lafayette, Ind. Dept. of Agricul-

For primary bibliographic entry see Field 5D. W76-01042

MODELS FOR HANDLING SOLID MANURE, B. Eftink, and L. Searle.

Successful Farming, Vol 71, No 11, p 28-30, October, 1973.

Descriptors: *Solid wastes, *Farm wastes, Management, Feed lots, Hogs, Cattle, Waste storage, Irrigation, Lagoons, Runoff, Costs, Capacity, Illinois, *Waste disposal. Identifiers: *Manure, *Handling.

Solid waste handling systems are discussed. One waste system requires less than 50 hours per year handling manure from 2,500 hogs. It utilizes 100 feet lengths of perforated polyvinyl chloride plastic pipe for irrigating holding pond water. Costs, capacities and problems of irrigating, scraping, storing and stacking animal wastes are discussed. (Frantz-East Central Oklahoma State) W76-01043

COSTS NOTED FOR SOLID AND LIQUID WASTE SYSTEM. For primary bibliographic entry see Field 5D. W76-01044

CATTLE FEEDLOT POLLUTION STUDY, Texas Tech. Univ., Lubbocks. Dept. of Agronomy. E. A. Coleman, W. Grub, R. C. Albin, G. F. Meenaghan, and D. M. Wells.

Interim Report No. 2 to Texas Water Quality Board, Texas Tech University Water Resources Center, Lubbock, Texas, April, 1971, WRC-71-2, 20 p. 8 tab.

Descriptors: *Waste treatment, *Waste disposal, *Cattle, *Feedlots, *Irrigation, *Runoff, Application rates, *Soil contamination, *Farm wastes, Salts, Cotton, Grain sorghum, Soybeans, Bermudagrass, *Agricultural runoff.

Germination studies, test plot studies, and field studies were made to determine beneficial or non-harmful rates at which runoff from cattle feedlots can be applied to growing crops. Results indicate that such runoff must be applied with caution to most crops, as it is very detrimental to the germination of most field crops in the High Plains area of West Texas and is also detrimental to readline; in the grant of the second control seedlings in the same area. However, relatively low application rates are beneficial to mature crops at least on a short term basis. The buildup of soluble salts in the upper 30 inches of the soil profile indicates that land disposal may not be the ultimate solution to runoff disposal. (Wetherill-East Central Oklahoma State)

CHANGES WE'VE MADE IN MANURE HAN-

DLING. Hoard's Dairyman, Vol 118, No 3, p 152-153, 204-205, February 10, 1973. 4 fig.

Descriptors: *Farm wastes, *Waste storage, *Waste disposal, *Runoff, *Costs, Cattle, Dairy industry, Equipment.
Identifiers: *Manure, Storage pits.

Four dairymen with herds ranging from 30 to 230 cows discuss changes in their waste handling methods. All have switched to storage pits and then to land disposal at costs ranging from \$850 to \$6,000. Each farmer explains his variation of waste storage with respect to less frequent handling and controlling runoff. Costs, disposal prac-tices and manure pits of each system are discussed (Frantz-East Central Oklahoma State) W76-01046

INCLUSION OF DRIED POULTRY WASTE AS A FEED INGREDIENT IN CATFISH RATIONS, Texas Agricultural and Extension Service, College

J. C. Fowler, and J. T. Lock. Feedstuffs, Vol 46, No 44, p 36, October 28, 1974. I fig, 2 tab, 4 ref.

Descriptors: *Catfishes, *Diets, Proteins, Performance, Taste, Poultry, Farm wastes. Identifiers: *Poultry waste.

A study was done to determine the feasibility of including air dried poultry waste as a feed in-gredient in catfish rations. Air-dried manure was used in the diets at a dietary level of 25 percent. All diets were calculated to contain essentially equal amounts of crude protein assuming that the hen manure contained 21 percent protein. Catfish consuming diets containing air-dried poultry waste had better weight gain than catfish consuming the control diet over the 150 day feeding period. Taste panel evaluation of the test tissue and control tissue revealed no significant differences. (Cameron-East Central Oklahoma State) W76-01091

THESE STOCKYARDS' SOLUTIONS COULD WORK FOR YOU.

For primary bibliographic entry see Field 5D. W76_01093

FARMLAND FARM STRESSES NO RUNOFF, LATEST TEST RESULTS. For primary bibliographic entry see Field 5D. W76-01094

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5E-Ultimate Disposal Of Wastes

GENERALIZED GEOLOGIC FRAMEWORK OF THE NATIONAL REACTOR TESTING STA-TION, IDAHO,

Geological Survey, Reston, Va. For primary bibliographic entry see Field 8E. W76-01191

TECHNOLOGY FOR THE CONVERSION OF SOLAR ENERGY TO FUEL GAS.

Pennsylvania Univ., Philadelphia.

Available from the National Technical Informa-Available from the National Technical Internation Service, Springfield, Va 22161, as PB-238 103, \$6.75 in paper copy, \$2.25 in microfiche. Report NSF/RANN/SE/GI34991/PR/73/4, January 31, 1974. 153 p. 34 fig. 10 ref. 35 tab.

Descriptors: *Methane. *Solid wastes. *Vegetation, *Fermentation, Methane bacteria, Algae, Water hyacinth, Kelps, Farm wastes, Grasses, Domestic wastes, Anaerobic conditions, Water pollution sources, Fueld, Gases.

The formation of methane by anaerobic fermentation of paper, grass, household garbage, fresh-water algae, water hyacinth, seaweed, cattle manure, dry manure, and dry dog food, separately or in various mixtures, was studied. The fermentations were carried out in sea water as well as in freshwater and at temperatures ranging from 33 to 48C. The digesters were operated as single-stage reactors in which both the acidogenic and methanogenic bacteria are present, or as two-stage digesters in which the groups of bacteria are separated into the two tanks operating in series. The most satisfactory materials for conversion to methane were freashwater algae (Chlorella) and a marine giant kelp (Macrocystis pyrifera). Water hyacinth and common seaweed (Ascophyllum nodosum) were resistant to attack by methaneproducing bacteria. Conversion of these materials was improved by pretreatment with cellulase or hot sodium hydroxide. Conversion of untreated animal waste was fairly effective, although pretreatment with hot sodium hydroxide appeared to improve conversion efficiency. Methane productivity from the two-stage digestion system was approximately equal to that from the singlestage system under essentially equivalent operating conditions. (Witt-IPC) W76-01218

CONTAINMENT AREA FACILITY CONCEPTS FOR DREDGED MATERIAL SEPARATION, DRYING, AND REHANDLING, Hittman Associates, Inc., Columbia, Md.

For primary bibliographic entry see Field 2G. W76-01220

TREATMENT OF WASTE WATERS FROM A COMBINED SEWER SYSTEM (EGYESITETT NYVIZEINEK TISZTITASA), For primary bibliographic entry see Field 5D. W76-01276 CSATORNAHALOZAT SZEN-

EXPERIMENTAL PROGRAM FOR UNWATER-ING DIGESTED DOMESTIC SEWAGE SLUDGE UNDER PLANT CONDITIONS (TERV A ROTHASZTOTT VAROSI SZENNYVIZTELEPI ISZAP UZEMI VIZTELENTESI KISER-M. Tamas

Hidrologiai Kozlony, Vol 52, No 11, p 489-495, November, 1972. 3 fig, 12 ref.

Descriptors: *Waste water treatment, *Sludge, *Dewatering, Treatment facilities, Pilot plants, Filters, Municipal wastes. Identifiers: Hungary, Vacuum-drum filter.

Plans for an experimental sludge dewatering installation serving at domestic waste water treat-ment plants in Hungary are described. Earlier technio-economic considerations controlling the application of dewatering in Hungary are reviewed and reasons justifying the construction of the experimental installation indicated. In this context, the preparatory work preceding the designing of the experimental plant, the considerations governing the selection of the technology, and the problems which the pilot plant is expected to answer are formulated. Under the expansion program of the existing treatment plant at Szekesfehervar an experimental vacuum-drum filter will be added. Information is presented for the plant experiments envisaged, on the procedure of experimentation, and data processing. (Sandoski-FIRL) W76-01283

DISPC AL OF DOMESTIC WASTEWATER BY

HILLSIDE SPRAYS, California State Dept. of Public Health, Berkeley. Bureau of Sanitary Engineering.

E. Seep.

Journal of the Environmental Division, Society of Civil Engineers, Vol 99, No EE2, p 109-121, April, 1973. 1 fig, 23 ref.

Descriptors: *Waste water disposal, *Spraying, Soils, Surface runoff, Design, Sewage, Effluents, California, Operation and maintenance, Land treatment

Identifiers: Land disposal, Hillside land applica-

Hillside land disposal spraying is a reliable method of domestic waste water land disposal which can be used in areas where the soils are not suitable for subsruface disposal or the terrain is too rough for the construction of evapotranspiration-percolation ponds. It is being practiced at approximately 100 camps, subdivisions, and small communities located on foothill and mountain areas throughout California. The goal of the disposal area design is to provide a system which will operate reliably with no surface runoff from the designated area. Design considerations involve: climate and Design considerations involve: climate and hydrology; geology, soil properties, and topography; treatment capability of soil; application rates; distribution system; public health and reliability requirements; and, operation and maintenance. The principal operational aspects of the spray disposal system are as follows: records are kept of all sewage bypasses, power failures, ef-fluent runoff, and disinfectant uses. Dosing is intermittent to maintain aerobic conditions and high infiltration rates. Spray areas are alternated to provide rest periods for breakup of biological slimes. No spraying is done on bare or disturbed soil, during rainstorms, or when the soil is saturated. No spraying is done during strong winds if the spray is carried toward nearby human habitations. Spray areas are inspected periodically for clogged sprinklers, dripping nozzles, broken pipes, leaking joints, erosion, and runoff. Spare parts should be maintained for all essential disposal functions to enable speedy repair of broken down equipment. (Sandoski-FIRL) W76-01295

THE ELIMINATION OF PHOSPHATES AND NITRATES OF WASTE WATER BY ALGAE CULTURES: I (/N FLEMISH),

Ghent Rijksuniversiteit (Belgium). Laboratorium voor Anorganiche Technische Chemie, Elektrotermie en Elektrochemie. For primary bibliographic entry see Field 5D. W76-01312

DISPOSAL OF FARM A THROUGH THE SOIL, Oregon State Univ., Corvallis. FARM ANIMAL WASTES For primary bibliographic entry see Field 5B. W76-01384

CONFINEMENT LIVESTOCK FACILITIES WASTE MANAGEMENT CODE OF PRACTICE. For primary bibliographic entry see Field 5D

W76-01386

AGRICULTURAL WASTES, (LITERATURE

Mississippi State Univ., State College. For primary bibliographic entry see Field 5D. W76-01390

OCEAN OUTFALLS AND OTHER METHODS OF TREATED WASTE-WATER DISPOSAL IN SOUTHEAST FLORIDA, (ENVIRONMENTAL IMPACT STATEMENT).

Environmental Protection Agency, Atlanta, Ga. Region IV.

For primary bibliographic entry see Field 5D. W76-01413

HOW MANY WASTEWATER TREATMENT PLANTS ARE NECESSARY IN REGIONAL SEWER SYSTEMS. (HANY SZENNYVIZTISZ-TITO TELEP LEGYEN A REGIONALIS CAA-TORNAERNDSZEBEN).

For primary bibliographic entry see Field 5D. W76-01429

WET OXIDATION DISPOSAL OF WASTE MATTER IN SUSPENSION. French Patent FR 2244-722. Issued May 23, 1975.

Derwent French Patents Abstracts, Vol W, No 26, p 4, August, 1975.

Descriptors: *Waste disposal, *Oxidation, Waste water treatment, Organic matter, Biochemical ox-ygen demand, Chemical oxygen demand.

A reactor for wet oxidation disposal of waste matter in suspension has been patented. The reactor is essentially a horizontal, cylindrical au-toclave, divided into several compartments by vertical partitions. An inlet line delivers liquid into the first of these compartments. Each compartment contains a top entry, high speed rotary shaft, with two vertically spaced agitators, and a bottom entry oxygen/air inlet nozzle. The nozzle is directed onto the underside of the lower agitator and disperses fine bubbles into the liquid. Transfer pipes aid in moving the liquid between compartments and in discharging it from the final chamber via separate vapor and liquid outlets. In the disposal of waste organic matter, BOD and COD values are reduced by 80 to 90%. Because of the intense dispersal of fine oxygenation bubbles, the process performs well at lower temperatures than previous wet oxidation processes. (Kramer-FIRL) W76-01430

CENTRIFUGING PLANT IN THE PURIFICA-TION PLANT MUNICH-GROSSLAPPEN (ZENTRIFUGENLAGE IM KLAERWERK MUENCHEN-GROSSLAPPEN), For primary bibliographic entry see Field 5D. W76-01439

5F. Water Treatment and **Quality Alteration**

WATER SUPPLIES FOR LOW-INCOME COM-MUNITIES IN DEVELOPING COUNTRIES, Birmingham Univ. (England) Dept. of Civil Engineering. For primary bibliographic entry see Field 5G. W76-01004

EXPERIMENTAL EUTROPHICATION OF TER-RESTRIAL AND AQUATIC ECOSYSTEMS.
FIRST ANNUAL REPORT OF THE UPLAND
RECHARGE PROJECT,
Brookhaven National Lab. Upton, N. Y. Biology

For primary bibliographic entry see Field 5D. W76-01155

THE SEWERS OF PARIS (LES EGOUTS DE 5G. Water Quality Control PARIS), Paris (France)

For primary bibliographic entry see Field 5D. W76-01293

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DEVELOPMENT AND USE OF FLOATING FIL-TERING MATERIALS IN WATER FILTRA-TION (RAZRABOTKA I VNEDRENIE PLAVAYUSHCHIKH ZAGRUZ
FIL'TROVANIYA VODY),
M. G. Zhurba, S. I. Moroz, and D. D. Myagkiy. ZAGRUZOK

Vodsnabzhenie i Sanitarnaya Tekhnika, No 5, p 13-17, 1975. 2 fig, 3 tab, 6 ref.

Descriptors: *Filtration, *Water treatment, *Waste water treatment, *Industrial wastes, Municipal wastes, Flotation, Tanks, Filters, Potable water, Suspended solids.
Identifiers: Filtering materials, Polystyrene foam.

Floating filtering materials and their uses are described. Polystyrene foam and lightweight aerated granules of originally compact materials are used as floating filter materials, arranged in filter tanks in one or more layers, or at one or more (usually two) levels. Floating filtering materials can be used for the purification of industrial and municipal waste water, and for the preparation of potable water from natural water. The suspended matter content in the water to be purified should not be greater than 500 mg/liter, and the rate of filtration should be between 0.6 and 2 m/hr. The granules of the filtering material should be 0.3-1.5 mm in diameter. The combined thickness of the filtering material arranged at two levels or in two layers is optimally between 0.7 and 1.2 m. Filtration rates over 20 m/hr are possible for drinking water preparation. (Takacs-FIRL) W76-01438

EVOLUTION OF OPERATION CONTROL IN WATER TREATMENT (A VIZTISZTITASI TECHNOLOGIAK UZEMIRANYITASANAK FEJLODESE), For primary bibliographic entry see Field 5D.

W76-01450

THE QUALITY AND TREATMENT OF ARTESIAN WATERS IN HUNGARY (A HAZAI MELYSEGI VIZEK KEZELESENEK SZUKSEGESSEGE ES TECHNOLOGIAJA),

Hidrologiai Kozlony, Vol 55, No 6, p 236-244, June, 1975. 8 fig, 2 tab, 4 ref, 8 photo.

Descriptors: *Water treatment, *Potable water, *Water supply, *Acquifers, Iron, Methane, Man-ganese, Filtration, Artesian wells. Identifiers: *Hungary, Melyepterv.

The main source of potable water supply in Hungary is artesian waters contained in aquifers 100 to 400 m deep. The water obtained had been of good drinking water quality. Recently, however, dissolved iron and manganese have been detected in amounts exceeding allowable limits. Additionally, considerable amounts of gas containing methane have appeared in these artesian waters. Therefore, prior to introduction into the distribution network, the artesian waters must be appropriately treated by iron and manganese removal as well as by degassing. Iron and manganese are removed by a conventional technique, involving oxidation with air under pressure, followed by filtration on twolaver sand filters. Surface aeration by means of revolving brushes has been applied for de-gassing, and tests are under way on a more simplified and economical new method. (Kramer-FIRL) W76-01453

WATER RIGHTS AND WATER QUALITY MANAGEMENT,
Virginia Polytechnic Inst. and State Univ..

Blacksburg. Water Resources Research Center.

W. R. Walker, and W. E. Cox.

Journal of the Hydraulics Division, American Dociety of Civil Engineers, Proceedings paper No. 11156, Vol 101, No HY3, p 511-516, March 1975.

Descriptors: *Water resources, *Water quality control, *Management, *Water rights, *Judicial decisions, *Institutional constraints, Administrative agencies, Letgislation, Regulation, Social

needs, Planning. Identifiers: Litigation, Restraint systems, Water

Water rights constitute the oldest institutional arrangement for control of water quality, but recent decades have seen extensive development of alternative controls. These new mechanisms for water quality management have replaced the system of water rights as the primary institution for quality control, but these rights still function in an important supplementary capacity. Examined is the na-ture of the water right as related to quality and the reasons why a different institutional arrangement for management has become necessary. Any qualitative change that substantially interferes with other legally-recognized uses of water is in violation of water rights, but the determination of whether or not a particular quality alteration is in violation of the rights of others is a function of the judicial process. The fact that water rights require court action for their enforcement is a basic defect with regard to their effectiveness as an institution for water quality management. Specific weakness as a managerial mechanism include the responsive nature of court action, the limited scope of litiga-tion between individuals, and the burden of proof facing the injured party. These weaknesses are largely overcome by the administrative agency approach, a basic reason for its widespread acceptance at present. Regarding water quality planning, water rights are restricted to the passive role of establishing guidelines, providing general limitations for the framework within which an administrative agency can make detailed planning decisions. (Bell-Cornell) W76-01001

AN OPTIMIZATION MODEL FOR BALANCING ECONOMIC-ENVIRONMENTAL SYSTEMS.

McGill Univ., Montreal (Quebec). Dept. of Civil

Engineering and Applied Mechanics.
D. Panagiotakopoulos.
Candian Journal of Civil Engineering, Vol 2, No 1, p 1-9, March 1975. 5 fig. 8 ref.

*Environmental Descriptors: *Economics, *Pollution abatement, *Wastes, *Methodology, Optimization, Costs, Water quality, Treatment, Networks, Management, Disposal, Sewerage, Decision making, Operations, Water policy, Biochemical oxygen demand, Simulation analysis, Computers, Mathematical models, Systems analysis. Identifiers: Comprehensive analysis, Data reduc-

tion, Absorbing capacity.

Resolutions of conflicts within an economic-environmental system are challenges that engineers often face, since they are expected to provide the decision-makers with the trade-offs involved among the various levels of the waste generating among the various levels of the waste generating economic activities, the resulting environmental quality, and spending for attaining it. A methodology is presented for resolving such conflicts. The methodology is based on a waste management network model which allows for an efficient and systematic search among the possible waste management systems linking generated wastes with the environment, and also for their

evaluation on the basis of the balance of their burdens on the various environmental forms and the operating budget. Recycling, discharge and ef-fluent standards, charges, damage costs, and vari-ous budgeting schemes can be handled. Dynamic analyses for long-range financial planning under an expected increasing rate of waste generation are possible. For a simple hypothetical case, the model is set up, available data are reduced to usa-ble forms, and trade-off curves are obtained through simulation analysis. (Bell-Cornell) W76-01002

FEDERAL-STATE RELATIONS IN WATER

QUALITY PLANNING,
Pennsylvania Dept. of Environmental Resources, Harrisburg. M. S. Alushin

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY3, Proceedings paper No 11160, p 523-531, March 1975. 9 ref.

Descriptors: *Water resources development, *Water quality control, *Legislation, *Regions, *Planning, Pollution abatement, Sewage treatment, River basins, Management. Identifiers: *Federal-state relationships

With the passage of the 1972 Amendments to the Federal Water Pollution Control Act, the Federal government for the first time significantly entered the field of water quality planning. The 1972 Act requires two distinct planning processes: (1) Statewide basin planning designed to accomplish general water quality planning and to establish maximum daily loads for areas where waste load allocations are needed; and (2) waste treatment management planning which is designed to provide a detailed description of the physical and institutional requirements for treatment works and waste management in limited areas characterized by urban-industrial concentration. The U.S. Environmental Protection Agency delay in promulgating regulations and a lack of Federal funding during 1972-1974 resulted in virtually no planning being done during that period. Even though Section 510 of the Act reserves rights to states and preserves their ability to adopt standards that are more stringent than Federal standards, the planning processes launched by Section 303(e) and Section 208 are explicit provisions which preclude options for the states. States are required to adopt a water quality standard approach. A drastically different method of water pollution management, such as effluent charges, would be preempted by the Federal statute. Nevertheless, most of the planning and standard setting is to be done by state or local agencies. (Bell-Cornell) W76-01003

WATER SUPPLIES FOR LOW-INCOME COM-MUNITIES IN DEVELOPING COUNTRIES. Birmingham Univ. (England) Dept. of Civil En-

gineering.

Journal of the Environmental Engineering Divi-sion, American Society of Civil Engineers, Vol 101, No EE5, Proceedings paper No 11608, p 687-702, October 1975, 6 tab, 16 ref.

Descriptors: *Water supply development, *Public health, *Water quality control, Forecasting, Hydraulics, Diseases, Population, Growth rates, Hydrauncs, Diseases, Population, Orowin fates, Effects, Resource allocation, Standards, Design, Benefits, Evaluation, Costs, Data collections. Identifiers: "Developing countries, "Water supply impacts, Low-income, Water collection, Improve-ment, Water plans, Municipalities.

In 1970, the World Health Organization found that 86% of the rural population in developing countries were without safe water. Presented is an analysis of the potential impact of a water supply system in a poor tropical community; considered are techniques for quantification of this impact.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

Special attention is paid to the water collection journey and to the anticipated improvements in community health. A useful approach is to identify specific design benefits and to base the design of an improved scheme on the achievements of these benefits. Various possible benefits are listed; savings in time and energy expended in water col-lection and improvements to health are suggested as being realistic design benefits for most situa-tions. A classification of water-related disease is presented and the effect of water supplies on various water-related infections is analyzed. A comous water-related infections is analyzed. A com-prehensive table, showing the principal features of these diseases, is included. Improvements to specific water-related infections can be used as design benefits for water supply schemes. A more rigorous approach to improving the standards of water supply facilities in developing countries is needed. An analysis of water supply impacts, particularly concerning water collection and health, can facilitate superior designs and more rational resource allocation for water supply programs. (Bell-Cornell)

FORMULATION AND USE OF PRACTICAL MODELS FOR RIVER QUALITY ASSESS-

Geological Survey, Portland, Oreg. Water Resources Div. W. G. Hines, D. A. Rickert, S. W. McKenzie, and J. P. Bennett.

Descriptors: "River basins, "Water quality, "Behavior, "Mathematical models, Hydrology, Alternative planning, Management, Simulation analysis, Evaluation, Physical properties, Biological properties, Chemical properties, Dissolved oxygen, Biochemical oxygen demand, Decision making, Date collections, Systems analysis.

Identifiers: Scientific assessment, Environmental impact, Model improvement, River phenomena, Date base, Willamette River(Ore.).

Complexities inherent in the study of large rivers and the need for quantitative description of river quality behavior have generated increasing interest in mathematical modeling. In concept, mathematical models have great potential as practical tools for predicting the impact of alternative planning proposals on river quality phenomena. A basis is provided for examining potential shortcomings in proposed river quality models and suggestions are made for improving them. Considered are six major deficiencies common to many applied modeling efforts: (1) application to a variable or process that is too complex for formulation of a practical, applied model; (2) application of a so-phisticated, general case model without adequate understanding of the particular river in question; (3) failure to recognize the importance of basin hydrology in defining the critical planning and management decision periods for model simulation; (4) misapplication of model calibration and verification procedures; (5) use of a poor data base for interpretation, calibration, and verification; and (6) failure to format results for ease in understanding. With carefull thought and interdisciplinary teamwork, these deficiencies may be corrected and conceptual models transformed into useful tools for river quality assessment. Examples are presented from a river quality study of the Willamette River, Oregon. (Bell-Cornell)

THE INTEGRATED MULTI-MEDIA POLLU-TION MODEL

Georgetown Univ., Washington, D.C. Dept. of

L. K. Paik, J. Harrington, Jr., and F. W. McElroy. Environmental Protection Agency Report EPA-600/5-74-020, February 1974. 259 p, 14 fig, 25 tab, 54 ref, append.

Descriptors: *Environment, *Resources, *Management, *Model studies, *Pollution abate-

ment, Land use, Simulation analysis, Computer programs, Economics, Waste water treatment, Wastes, Diffusion, Water pollution, Rivers, Biochemical oxygen demand, Dissolved oxygen, Industries, Pollutants, Air pollution, Equations, Systems analysis, Planning.
Identifiers: *Steady-state model, *Environmental

quality control, Nonlinearity, Residual manage-ment submodel, Dispersion submodel, *Integrated Multi-Media Pollution Model, Land use submodel, Metropolitan regions.

The primary objective was to develop a prototype multi-pollution model for a typical metropolitan region. The basic design and some of the results of initial testing of the model are presented. The Integrated Multi-Media Pollution Model, IMMP, views environmental pollution as a set of in terrelated problems -- the solution of which requires examination of all types of pollution jointly and simultaneously -- and attempts to seek an overall solution to environmental resouce management. Specifically, the model embodies the trade-offs among different forms of residuals disposed finally in the environment that are effected by alternative land use policies, production processes, pollution control strategies and methods. Thus, the Land Use submodel relates various land use policies to the distribution of the sources of environmental pollution. The Residuals Management submodel relates alternative levels of pollution generating activities, input mixes, production processes of various activities, and the alternative treatment processes associated therewith to the magnitude, composition and distribution of pollu-tants. The Disposal-Dispersion submodel relates pollution emissions at source to (ambient) environmental quality at destination. The model provides a comprehensive framework in which to test and evaluate a wide range of strategies for planning, managing and con resources. (Bell-Cornell) controlling

SOURCES AND FATE OF 'AVAILABLE' NITROGEN IN RURAL ECOSYSTEMS,

Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5B. W76-01031

IMPACT OF NITRATE FERTILIZER RESTRIC-TIONS ON SALT RIVER PROJECT AND ROOSEVELT WATER CONSERVATION DIS-TRICT GROWERS,

Arizona Univ., Tucson, Dept. of Agricultural Economics. For primary bibliographic entry see Field 5C. W76-01114

SALINITY POLICY FOR COLORADO RIVER

Colorado State Univ., Fort Collins. Dept. of

Agricultural Engineering.
G. V. Skogerboe, and W. R. Walker.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 101, No HY8, p 1067-1075, August, 1975. 1 fig, 13 ref.

Descriptors: *Salinity, *Colorado River, *Water policy, *Water quality control, *Water law, Water pollution, Saline water, Salts, Irrigation water, Desalination, Colorado River Basin, Colorado River Compact, Mexican Water Treaty, Water resources, Mexico, Water supply, Impared water quality, Costs, Arizona, California, Water management(Applied).

Identifiers: *Salinity control.

Increasing salinity concentrations in the Colorado River are threatening the utility of water resources in the downstream areas of Arizona, California, and the Republic of Mexico. The U.S. Environmental Protection Agency reports that existing damages to lower basin users would increase from \$16,000,000 annually in 1970 to \$51,000,000 an-

nually by the turn of the century if planned developments do not include appropriate salinity control measure. A brief description of the most important salinity control measures is given along with a short summary of the Colorado River Compact, the Upper Colorado River Compact, and the Mexican Water Treaty. The water quality goal for the Colorado River to maintaining salinity concentrations in the lower stem at or below present levels would be better than setting numerical stan-dards. This policy should be applied to each state by offsetting salinity detriments resulting from each new development with salinity control measures that will maintain a net salt balance leaving state boundaries. (Robinett-Arizona) W76-01126

SUBMERSIBLE OIL BOOM,

Submarine Engineering Associates, Inc., Cohasset, Mass. (assignee).

set, Mass. (assignees). R. A. Benson. U. S. Patent No 3,859,796, 6 p, 14 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 930, No 2, p 622, January 14, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, *Water pollution control, Equipment, Barriers, Water quality control. Identifiers: *Pollution prevention, Oil booms, Submersible oil booms.

An oil containment barrier or boom is made up of submersible barrier sections, each comprising a vertical dam, preferably at least 1/4 inch thick constructed of elastic, resilently stretchable, solid, plastic, rubberlike material having Shore A scale durometer hardness between 60 and 90 and resiliently deformable in all directions. Each submersible flotation element has an outer shell, preferably elastically and resiliently deformable in all directions. Although the shell may be charged with air or water to float or sink it, it is preferred that resiliently expandable and compressible gasfilled flotation means, perferably a closed cell plastic foam material or a sealed, gas-filled collapsible tube or gas-filled compressible spheres or other such elements, be employed to float the barrier section when expanded for fail-safe operation, together with operating means, such as a collapsi-ble hollow operating tube, or simply the remaining volume within the shell itself, for compressing the gas-filled flotation means to sink the barrier section. (Sinha-OEIS)

DEPLOYABLE SYSTEM FOR CONTAINING OIL SPILLS, E. N. Fisher.

U.S. Patent No 3,863,694, 4 p, 13 fig, 5 ref; Official Gazette of the uUnited States Patent Office, Vol 931, No 1, p 154, February 4, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, *Water pollution control, Equipment, Storage tanks, Soil management. Identifiers: *Pollution prevention.

A system is described for containing oil spills or leaks from small oil storage tanks. The system comprises a diaphragm of polyvinyl chloride, synthetic rubber or the like, formed in a circular pattern of radius approximately equal to the radius of the storage tank plus its height. The circular diaphragm is placed under the tank and centered with respect thereto. The edge of the diaphragm is pleated and fastened to a tension ring which sur-rounds the upper part of the tank and is held in place by friction or other suitable means. When a leak occurs, the tension ring releases and slides down the tank as the diaphragm fills with escaping oil. The deployment of the diaphragm, which can be seen from many miles, particularly from the air, serves as a visual indication that a leak has oc-curred; in the fully deployed condition, the diaphragm is capable of containing the entire con-tents of the oil storage tank. The use of the deploy-

WATER QUALITY MANAGEMENT AND PROTECTION-Field 5

Water Quality Control-Group 5G

able diaphragm oil containmen' system prevents soil, water and air pollution, substantial financial loss due to unrecoverable fuel oil, and personal hardship resulting from the failure of a bulk oil stroage tank. (Sinha-OEIS) W76-01133

AN EVALUATION OF ARTIFICIAL DESTRATIFICATION FOR CONTROL OF ALGAL BLOOMS, Tetra Tech, Inc., Lafayette, Calif.

For primary bibliographic entry see Field 5C.

USE OF WATERHYACINTHS TO REMOVE NITROGEN AND PHOSPHORUS FROM EUTROPHIC WATERS, Louisiana Agricultural Experiment Station, Baton

For primary bibliographic entry see Field 5C.

W76-01148

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PROPAGATION OF SPARTINA ALTERNIFLORA FOR SUBSTRATE STABILIZATION AND SALT MARSH DEVELOPMENT, North Carolina State Univ., Raleigh.

For primary bibliographic entry see Field 2L. W76-01169

HYDROGEOLOGY ALONG THE PROPOSED BARRIER-RECHARGE-WELL ALINEMENT IN SOUTHERN NASSAU ISLAND, NEW YORK, COUNTY, LONG

Geological Survey, Mineola, N. Y. For primary bibliographic entry see Field 4B.

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BAUXITE REFINING SUBCATEGARY OF THE ALUMINUM SEGMENT OF THE NON-FERROUS METALS MANUFACTURING POINT

SOURCE CATEGORY, Environmental Protection Agency, Washington D.C. Effluent Guidelines Div.

G. S. Thompson, Jr.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 463, \$5.00 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-019-c, March 1974. 99 p, 8 fig, 14 ref, 16 tab. 68-01-1518

Descriptors: *Aluminum, *Waste water treatment, *Water pollution treatment, Wastes, Industrial Water pollution sources, Water quality control, Water quality, Capital costs, Operating costs, Costs, Metals, Water purification, Economics, Standards, Effluents, Water quality standards, Regulation, Metallurgy. Identifiers: *Bauxite, Ores.

A study of the bauxite refining industry led to the development of effluent limitation guides and standards of performance for the industry. Effluent limitation guidelines presented set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the best availa-ble technology economically achievable, which must be implemented by existing point sources by July 1, 1977, and July 1, 1983, respectively. Refining processes, wastes, and waste treatment processes and their costs are discussed. (Witt-IPC) W76-01201

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TIRE AND SYNTHETIC SEGMENT OF THE RUBBER PROCESSING POINT SOURCE

CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

J. E. Riley.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 609, \$5.00 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-013-a February, 1974. 193 p, 12 fig, 30 ref, 43 tab. 68-01-1510.

Descriptors: *Waste water treatment, *Rubber, *Water quality standards, Water pollution treatment, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Wat costs, Capital costs, Water pullation, Water pullity, Standards, Economics, Synthetic rubber, Effluents, Regulation, Chemical industry. Standards,

Identifiers: *Rubber industry, *Tire industry.

Presented are findings of a study of the tire and inner tube and synthetic rubber segments of the rubber processing industry for the purpose of developing effluent limitations guidelines for the industry. The guidelines set forth the degree of effects of the segment of the second segment of the segment of the second segment of the second segment of the segment of fluent reduction attainable through the application of the best practicable control technology currently available and through the application best available technology economically achieva-ble. The tire and inner tube and synthetic rubber segments of the industry are divided into four sub categories on the basis of the characteristics of the manufacturing processes involved. Separate ef-fluent limitations are developed for each category on the basis of the level of raw waste load, as well as on the degree of treatment achievable by the suggested model systems. These systems include both biological and physical/chemical treatment, and for the synthetic rubber subcategories treatment of the secondary effluent by carbon adsorption. Supportive data and the rationale for development of the proposed effluent limitation guidelines and standards are discussed. Manufacturing processes, wastes, and waste treatment processes and costs are described. (Witt-IPC)

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SOAP AND DETERGENT MANUFACTUR-

ING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington,
D.C. Effluent Guidelines Div.

R. T. Gregg.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 613, \$7.75 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-018-a, April, 1974. 213 p, 37 fig, 70 ref, 6 tab. 69-01-1517.

Descriptors: *Detergents, *Soaps, *Waste water treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Water pollution control, Water quality, Chemical industry, Chemical wastes, Ecnomics, Chemical industry, Effluents, Regulation.

Findings are presented of an extensive study of the soap and detergent manufacturing industry for the purpose of developing effluent limitation guidelines, Federal standards of performance, and pretreatment standards for the industry. The development of data and recommendations relate to the 19 subcategories into which the industry is divided on the basis of raw waste loads and ap-propriate control and treatment technology. Separate effluent limitations are proposed for each category on the basis of raw waste load control and end-of-pipe treatment achievable by suggested model systems. Supportive data and rationale for development of the proposed effluent limitation guidelines and standards of performance are presented. Potential approaches for achieving the limitation levels and their associated costs are discussed. (Witt-IPC)

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR NEW SOURCES. BEET SUGAR PROCESSING SUBCATEGORY OF THE SUGAR PROCESSING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington,

D.C. Effluent Guidelines Div.

R. V. Watkins.

Available from the National Technical Informa-tion Service, Springfield, Va 22161, as PB-238 462, \$6.75 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-002-b, January, 1974. 172 p, 15 fig, 8 tab, 109 ref.

Descriptors: *Sugar beets, *Waste water treatment, *Water quality standards, Water pollution treatment, Wastes, Industrial wastes, Water pollution sources, Capital costs, Operating costs, Costs, Economics, Water quality, Standards, Car-bohydrates, Effluents, Regulation. Identifiers: "Sugar refining, "Sugar industry.

Findings are presented of a study of the beet sugar processing industry for the purpose of developing effluent limitation guidelines for the industry. The guidelines set forth the degree of effluent reducguidelines set forth the degree of entuent reduction tion attainable through the application of the best practicable control technology currently available and the best available technology economically achievable. Supportive data and rational for development of the effluent limitation guidelines and standards are presented, and processing and refining operations, wastes, and waste treatment processes and costs are described. (Witt-IPC) W76-01204

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE MAJOR INORGANIC PRODUCTS SEG-MENT OF THE INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGO-

RY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

For primary bibliographic entry see Field 5D. W76-01205

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE RED MEAT PROCESSING SEGMENTS OF THE MEAT PRODUCTS AND RENDERING PROCESSING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5D.

W76-01206

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR TEXTILE MILLS POINT SOURCE CATEGORY,

Enivronmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5D.

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS -FEEDLOTS POINT SOURCE CATEGORY Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

Available from the National Technical Informa-tion Service, Springfield, Va 22161, as PB-238 651,

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

\$9.75 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-004-a, January, 1974. 329 p, 68 fig. 257 ref. 40 tab. 68-01-0595.

Descriptors: *Feed lots, *Farm wastes, *Waste water treatment, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Water pollution, Water pollution, Costs, Capital costs, Operating costs, Domestic animals, Cattle, Cheen Dark (Domestic) Hose, Poultry, Linuid Sheep, Ducks(Domestic), Hogs, Poultry, Liquid wastes, Solid wastes, Waste disposal, Effluents, Regulation

Identifiers: Turkeys, Chickens, Beef cattle, Dairy cattle. Horses.

Findings are reported of an extensive study of the feedlot industry for the purpose of developing effluent limitation guidelines and standards for the industry. Feedlots for the following animal types were considered in this study: beef cattle, dairy cattle, swine, chickens, turkeys, sheep, ducks, and horses. Guidelines are set forth for effluent reduction attainable through the application of the best practicable control technology currently available and the best avialable technology economically achievable by July 1, 1977, and July 1, 1983, respectively. Supportive data and ra tionale for development of the proposed guidelines are included. Wastes and waste treatment are included. Wastes and waste treatment processes and their costs are discussed. (Witt-IPC) W76-01208

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SYNTHETIC RESINS SEGMENT OF THE PLASTICS AND SYNTHETIC MATERIALS MANUFACTURING POINT SOURCE CATEGO-

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div

D. L. Becker.

Available from the National Technical Information Service, Springfield, Va 22161. as PB-239 241, \$8.00 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-010-a, March, 1974. 252 p, 40 fig. 78 ref, 46 tab. 68-01-1500.

Descriptors: *Industrial wastes, *Waste water treatment, *Water quality standards, Water pollution treatment, Wastes, Water pollution sources, Water quality control, Water pollution, Water pollution control, Waste treatment, Costs, Operating costs, Capital costs, Resins, Plastics, Regulation. Identifiers: *Plastics industry.

Findings are presented of an extensive study of the synthetic resin segment of the plastics and synthetics industry for the purpose of developing effluent limitation guidelines and standards. Guidelines and standards were developed for the following major products: acrylonitrile-butadienestyrene/styrene-acrylonitrile resin, acrylics, cellophane, cellulose acetate, high- and low-density polyethylene, Nylon 6 and 66, polyester, polypropylene, polystyrene, polyvinyl acetate, polyvinyl chloride, and rayon. Effluent guidelines presented set forth the degree of reduction of polypropylene. lutants in effluents that is attainable through the application of the best practicable control technology currently available and by application of the best available technology ecnomically achievable by existing point sources by July 1, 1977, and July 1, 1983, respectively. Manufacturing processes, wastes, and waste treatment methods and their costs are discussed. (Witt-IPC) W76-01209

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SMELTING AND SLAG PROCESSING

SEGMENTS OF THE FERROALLOY MANU-FACTURING POINT SOURCE CATEGORY,. Environmental Protection Agency, Washington, . Effluent Guidelines Div.

P. W. Diercks.

Available from the National Technical Informa-Tion Service, Springfield, Va 22161, as PB-238 650, \$6.75 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-008-a, February 1974. 179 p, 20 fig, 35 ref, 101 tab. 68-01-1527.

Descriptors: *Waste water treatment, *Water pol-lution treatment, *Water quality standards, *Steel, *Iron, Wastes, Industrial wastes, Water pollution sources, Water quality control, Water pollution, Water pollution control, Water quality, Waste water political control, water quality, waste treatment, Costs, Capital costs, Operating costs, Effluents, Regulation, Metallurgy. Identifiers: *Iron and steel industry, Slags.

For the purpose of establishing effluent limitation guidelines and standards of performance for the ferroalloys industry, the industry has been categorized on the basis of the types of furnaces, air pollution control equipment installed, and water uses. The catergories include open electric furnaces with wet air pollution control devices, covered electric furnaces and other smelting operations with wet air pollution control devices, and slag processing. The effluent limitations to be achieved by July 1, 1977, are based upon the pollution reduction attainable using treatment technologies as presently practiced by the average of the best plants in these categories. The technologies are for the most part based upon end-of-pipe treat-ment and once-through water usage. The effluent limitations to be achieved by July 1, 1983, are based upon the pollution reduction attainable using control and treatment technologies as using control and treatment technologies as presently practiced by the best plant in each category. Costs are given for the various levels of treatment identified for each category and for the attainment of the suggested effluent guidelines. (Witt-IPC) W76-01210

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE DAIRY PRODUCT PROCESSING POINT SOURCE CATEGORY,

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

R. Gregg.

Available from the National Technical Informa-

tion Service, Springfield, Va 22161, as PB-238 835, \$6.75 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-021-a, May, 1974. 174 p, 23 fig, 149 ref, 28 tab. 68-01-1502.

Descriptors: *Dairy industry, *Waste water treat-ment, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water pollution, Water pollution control, Water quality control, wate treatment, Costs, Operating costs, Capital costs, Food processing industry, Regulation, Effluents.

Findings are presented of an extensive study of the dairy products processing industry for the pur-pose of developing effluent limitation guidelines, standards, and pretreatment standards for the industry. The guidelines presented set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently avialable and by application of the best available technology ecnomically achievable, which must be implemented by existing plants by July 1, 1977, and July 1, 1983, respec-tively. The development of data and recommenda-tions relate to the 12 subcategories into which the industry has been divided on the basis of the levels of raw waste loads and appropriate control and treatment technology. Separate effluent limitations are developed for each subcategory on the basis of raw waste load as well as on the degree of treatment and control achievable by the suggested model systems. Supportive data and rationale for development of the proposed effluent limitation guidelines and standards are included. Potential approaches for achieving the reduced pollution loads and their costs are discussed. (Witt-IPC)

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DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE UNBLEACHED KRAFT AND SEMICHEMICAL PULP SEGMENT OF THE PULP, PAPER, AND PAPERBOARD MILLS POINT SOURCE CATEGORY,

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. C. Vogt.

Avialable from the National Technical Information Service, Springfield, Va 22161, as PB-238 833, \$10.00 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-025-a, May, 1974. 351 p, 43 fig, 132 ref, 75 tab. 68-01-1514.

Descriptors: *Pulp wastes, *Waste water treatment, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollustandards, Wastes, Industrial Wastes, Water pollution sources, Water pollution control, Water pollution control, Water quaity control, Waste treatment, Pulp and paper industry, Costs, Operating costs, Capital costs, Effluents, Regulation.

Identifiers: Kraft mills, Sulfite mills, Board mills.

Findings are presented of a study of the unbleached kraft, semichemical, and paperboard segment of the pulp, paper, and paperboard industry for the purpose of developing effluent limitation guidelines for existing plants and standards of performance for new plants. Effluent limitations are set forth for the degree of effluent reduction attainable through the application of the best pracattainable through the application of the best fracticable control technology currently avialable and the best avialable technology economically achievable, which must be achieved by existing point sources by July 1, 1977, and July 1, 1983, respectively. The identified technology for new sources performance standards is in-plant waster. water control and secondary treatment. The identified in-plant controls and external treatment systems are avialable for implementation as they we all been deomonstrated at mills within the subcategories under study. Supporting data and ra-tionale for the development of the effluent limitations and standrds of performance are given. Manufacturing processes, wastes, and waste treat-ment processes and costs are discussed. (Witt-W76-01212

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BASIC FERTILIZERS CHEMICALS SEG-MENT OF THE FERTILIZER MANUFACTUR-ING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington,

D.C. Effluent Guidelines Div. F F Martin

Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 652, \$6.75 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-011-a, March, 1974. 175 p, 33 fig, 24 ref, 3 tab. 68-01-1508.

Descriptors: *Waste water treatment, *Fertilizers, *Water pollution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Water pollution, Water pollution control, Water quality, Waste treatment, Costs, Capital costs, Operating costs, Chemical industry, Phosphates, Ammonium com-pounds, Ureas, Nitrates, Chemical wastes, Inorganic compounds, Effluents, Regulation. Identifiers: *Fertilizer industry.

Findings are presented of an extensive study of the fertilizer industry for the purpose of develop-

Water Quality Control—Group 5G

ing effluent limitation guidelines and standards of ing effuent limitation guidelines and standards of performance and pretreatment standards. The fertilizer industry is divided into five categories for more meaningful separation and division of waste water treatment and development of effuent guidelines. These subcategories are phosphate, ammonia, urea, ammonium nitrate, and nitric acid products. The phosphate subcategory includes all products. The phosphate subcategory includes all ancillary operations necessary for phosphate production. Effluent guidelines for best practicable control technology currently available, best available technology economically achievable, and new source performance standards are recom-mended for each category. Manufacturing processes, wastes, and waste treatment methods and their costs are discussed. (Witt-IPC) W76-01213

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE STEEL MAKING SEGMENT OF THE IRON AND STEEL MANUFACTURING POINT

SOURCE CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guelines Div.

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Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 837. \$12.00 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-024-a, June, 1974. 476 p, 84 fig, 143 ref, 79 tab. 68-01-1507.

Descriptors: *Waste water treatment, *Steel, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution, Water pollution control, Water quality control, Waste treatment, Costs, Capital costs, Operating costs, Iron, Metal-

lurgy.
Identifiers: *Iron and steel industry.

The effluent limitation guidelines proposed for the raw steel making operations of the iron and steel industry set forth the effluent quality attainable through the application of the best practicable control technology currently available and through ap-plication of the best available technology economically achievable, which must be achieved by 1977 and 1983, respectively. Supporting data and rationale for development of the effluent limitation guidelines and standards are given. Manufacturing processes, wastes, and waste treatment methods and costs are discussed. (Witt-IPC) W76-01214

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE INSULATION FIBERGLASS MANUFACTURING SEGMENT OF THE GLASS MANUFACTURING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

M. W. Kosakowski.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 078, \$5.50 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-001-b, January, 1974. 105 p, 18 fig, 16 ref, 19 tab.

Descriptors: *Waste water treatment, *Water pol-lution treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution wastes, Industrial wastes, waster pollution sources, Water pollution, Water pollution control, Water quality control, Waste treatment, Costs, Operating costs, Capital costs, Insulation, Thermal insulation. Identifiers: *Glass industry, Fiberglass.

Findings are presented of an extensive study of fiberglass insulation manufacturing for the purpose of developing effluent limitation guidelines. The guidelines set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently availabe and with the best available technology availabe and with the best available technology economically achievable, which must be achieved by existing plants by 1977 and 1983, respectively. Supportive data and rationale for development of the proposed effluent limitation guidelines are presented. Manufacturing processes, wastes, and waste treatment processes and costs are discussed. (Witt-IPC) W76-01215

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE APPLE, CITRUS, AND POTATO
PROCESSING SEGMENT OF THE CANNED
AND PRESERVED FRUITS AND VEGETABLES
POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington,

D.C. Effluent Guidelines Div

Available from the National Technical Informa-Name of the National Technical International Technical Internation Service, Springfield, Va 22161, as PB-238 649, \$7.75 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-027-a, March, 1974. 228 p, 9 fig, 34 ref, 44 tab. 68-01-1528.

Descriptors: *Food processing industry, *Canneries, *Waste water treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollu-tion, Water pollution control, Water quality, Waste treatment, Citrus fruits, Apples, Potatoes, Water pollution treatment, Economics, Standards, Irrigation, Water reuse, Biological treatment, Effluents. Regulation.

A study was made of the apple, citrus, and potato processing segment of the canned and preserved fruits and vegetables industry for the purpose of developing waste water limitation guidelines. The guidelines set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the best available technology economically achievable, which must be achieved by existing point sources by July 1, 1977, and July 1, 1983, respectively. Land treatment systems, such as spray or flood irrigation, are effective and economic alternatives to the biological systems described. When suitable land is available, spray or flood irrigation are preferred to biological treatment. Processes, wastes, and waste treatment methods and their costs are discussed. (Witt-IPC)

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BUILDING, CONSTRUCTION, AND PAPER SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY, Environemental Protection Agency, Washington,

D.C. Effluent Guidelines Div.

Available from the National Technical Informa tion Service, Springfield, Va 22161, as PB-238 320, 86.00 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-017-a, February, 1974. 142 p, 15 fig, 27 ref, 9 tab. 68-01-1505.

Descriptors: *Waste water treatment, *Asbestos, *Asbestos cement, *Pulp wastes, *Water quality Assestos cement, Fruip wastes, Water quality standards, Industrial wastes, Wastes, Water pollution treatment, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Waste treatment, Roofing materials, Pipes, Tiles, Concrete pipes, Construction materials, Effluents.

Findings are presented of an extensive study of a segment of the asbestos manufacturing industry the purpose of developing effluent limitation guidelines. Separate effluent limitation guidelines are developed for the asbestos-cement pipe, asbestos-cement sheet, asbestos paper (with starch and elastomeric binders). asbestos millboard, asbestos roofing, and asbestos floor tile manufacturing segments of the asbestos industry on the basis of treatment achievable by suggested on the bass of treatment achievable by suggested model systems. Supportive data and rationale for development of the proposed effluent limitation guidelines are presented. Manufacturing processes, wastes, and waste treatment processes and costs are discussed. (Witt-IPG) W76-01217

FILTER BELT OIL RECOVERY SYSTEM. Martin Marietta Aerospace, Denver, Colo. Denver

R. O. Moses, and S. L. Blackstone

Available from the National Technical Informa-tion Service, Springfield, Va 22161, as AD A0-03831, \$9.75 in paper copy, \$2.25 in microfiche. U.S. Coast Guard Report CG-D-82-74, December, 1971. 316 p, 155 fig, 4 ref, 25 tab.

Descriptors: *Oil spills, *Water pollution treatment, *Sea water, Water pollution sources, Oil ment, 'Sea water, water pollution, Sources, Oil wastes. Water pollution control, Performance, Engineering, Filters, Testing, Design, Powerplants, Equipment, Prototypes, Filtration, Separation techniques.

The results of a systems development program (Phase I) for preliminary design of an ocean oil spill recovery system are presented. The design goal of the system is to recover and offload up to 2000 gpm of spilled oil and to operate in waves up to 5 ft in average height. The recovery system consists of an oil-recovery device mounted on a catamaran boat hull and an oil-transfer system mounted within the boat hull to offload the recovered oil. Oil is recovered by a porous oleophilic belt that performs basically as a fluid/fluid filter. The filter recovers oil from the surface of the water, filters out the excess water, and conveys the oil to squeeze rolls where the oil is exveys the on to squeeze rous where the on is ex-tracted. Basic filter material performance testing, filter belt development, model testing, subsystem (oil recovery, oil transfer, and auxiliary power subsystems) requirements, and preliminary design are described. (Witt-IPC) W76-01222

INDUSTRY WASTE STUDY. THE HAWAII SUGAR INDUSTRY WASTE STUDY.

Environmental Protection Agency, San Francisco, Calif. Region IX. For primary bibliographic entry see Field 5B. W76-01224

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, PHASE II, APPENDIX I. DESIGN STUDIES AND SPECIFICATIONS,

Ocean Systems, Inc., Reston, Va.
R. L. Beach, F. A. March, L. S. Brown, T. S.
McMahon, and J. Papp.
Available from the National Technical Informa-

tion Service, Springfield, Va 22161, as AD/A-003
934, \$6.00 in paper copy, \$2.25 in microfiche. U.S.
Coast Guard Report No CG-D-84-74, April, 1974.

Descriptors: *Oil spills, *Equipment, *Sea water, *Water pollution treatment, Design, Specifica-tions, Water pollution sources, Oil production, Oil wastes, Water pollutio, Construction, Testing, Prototypes, Research and development, Powerplants, Pressure, Hoses, Oil, Oceans, Construc-tion materials, Pumps.

A prototype oil spill recovery system has been designed and constructed. The initial part of this report describes studies carried out to compare and evaluate materials (acrylonitrile-butadienestyrene, aluminum, polyester/glass laminate, polyvinyl chloride, plywood, polycarbonate, and Royalex, and acrylonitrile-butadiene-styrene/vinyl foam laminate) for their potential use in rigid ele-ments of the weir/basin, the pressure drop for dif-

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

ferent oil transfer hose configurations, and alternative ways of deploying and recovering the oil recovery apparatus. The latter part of this report gives specifications for construction and specific components of the apparatus, including the power supply system. (See also W76-01226 and W76-01227) (Witt-IPC) W76-01225

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, PHASE II, APPENDIX II. MATERIALS AND COMPONENT TESTS,

Ocean Systems, Inc., Reston, Va. R. L. Beach, F. A. March, L. S. Brown, T. S.

McMahon, and J. Papp.

Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 946, \$7.75 in paper copy, \$2.25 in microfiche. U.S. Coast Guard Report No CG-D-84-74, April, 1974. 232 p, 52 fig, 44 tab.

Descriptors: *Oil spills, *Sea water, *Water pollution treatment, *Prototype tests, *Equipment, Qil, Oceans, Fabrics, Coatings, Adhesives, Testing, Joints(Connections), Prototypes, Construction materials, Loads(Forces), Strength, Mechanical properties, Pump testing, Control systems, Water pollution sources, Weirs, Oil pollution, Pumps.

A prototype oil spill recovery system has been designed and constructed. This report describes tests of the subsystems and components, including tests with a full-scale model of the secondary weir using 4 different weight oils, the oil resistance of fabrics, coatings, adhesives, mechanical joints, and construction materials, maximum expected load on the intermediate flotation section, strength of foam stiffeners used to connect the intermediate flotation sections to the secondary weir, secondary weir pump suction manifold, control system, and the oil-water interface sensor. (See 76-01225 and W76-01227) (Witt-IPC) W76-01226

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, PHASE II, APPENDIX III. SYSTEM TESTS,

Ocean Systems, Inc., Reston, Va

R. L. Beach, F. A. March, L. S. Brown, T. S. McMahon, and J. Papp. Available from the National Technical Information Service, Springfield, Va 22161, as ADA-003 947, \$9.25 in paper copy, \$2.25 in microfiche. U.S. Coast Guard Report No CG-D-84-74, April, 1974. 308 p, 29 fig, 14 tab.

Descriptors: *Prototype tests, *Water pollution treatment, *Oil spills, *Equipment, Water pollu-tion sources, Oil pollution, Oil wastes, Water pollution, Prototypes, Testing, Oil, Oceans, Pumping, On-site tests, Performance, Pump testing, Pumps.

A prototype oil spill recovery system has been designed and constructed. This report describes tests to determine the operability and preliminary operating parameters of the transfer pumping system. The tests included water pumping, viscous oil (3500 cp) pumping, and viscous oil pumping with simultaneous water injection into the suction manifold. Oil-recovery tests in a large pond at Richland, Washington are described. The tests utilized light and heavy fuel oils in calm water and 2 ft waves, with tow speeds to 2.76 knots. Procedures for at-sea tests are outlined. (See also W76-01225 and W76-01226) (Witt-IPC) W76-01227

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SECONDARY ALUMINUM SMELTING SUBCATEGORY OF THE ALUMINUM SEGMENT OF THE NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGO-

RY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. G. S. Thompson, Jr.

Available from the National Technical Informa tion Service, Springfield, Va 22161, as PB-238 464, \$6.00 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-019-e, March, 1974. 131 p, 9 fig, 20 ref, 29 tab.68-01-1518.

Descriptors: *Aluminum, *Waste water treatment, *Water quality standards, Water pollution treatment, Wastes, Industrial wastes, Water pollution ment, wastes, industrial wastes, water poliution sources, Water quality control, Costs, Capital costs, Operating costs, Metals, Aluminum alloys, Cooling water, Water pollution, Water pollution control, Water quality, Standards, Economics, Metallurgy, Effluents, Regulation.

An extensive study of the secondary aluminum smelting industry was conducted for the purpose of developing effluent limitation guidelines and standards of performance. The guidelines set forth the degree of effluent reduction attainable through application of the best practicable control technology currently available and attainable with the application of the best available technology economically achievable. The development of data and recommendations relate to waste waters generated in metal cooling, fume srubbing, and wet residue processing. The best practicable control technology currently available, the best available technology economically achievable, and the best available demonstrated control technology for each of these waste water streams are presented. The effluent limitations and standards of performance corresponding to these technologies also are presented. Supporting data and rationale for development of the effluent limitation guidelines and standards of performance are in-cluded. Costs are estimated. (Witt-IPC) W76-01231

EFFICIENCY OF OIL SPILL REMOVERS. For primary bibliographic entry see Field 5D. W76-01232

EXPERIMENTAL PROTOTYPE OILY WASTE-WATER TREATMENT SYSTEM. Holt (Ben) Co., Pasadena, Calif. For primary bibliographic entry see Field 5D. W76-01236

DEVELOPMENT DOCUMENT FOR EFFLUENT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR THE CATFISH, CRAB, SHRIMP AND TUNA SEGMENTS OF THE CANNED AND PRESERVED SEAFOOD PROCESSING INDUSTRY POINT SOURCE CATEGORY

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. E H Forsht

Available from the National Technical Information Service, Springfield, Va 22161, as PB-238 614, \$10.75 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-020-a, June 1974. 399 p, 65 fig, 345 ref, 119 tab. 68-01-1526.

Descriptors: *Food processing industry, *Waste water treatment, *Water quality standards, Wastes, Industrial wastes, Water pollution sources, Water quality control, Costs, Operating costs, Capital costs, Water pollution, Water pollution control, Water quality, Fish, Catfishes, Crabs, Shrimp, Evaluation, Economics, Standards, Water pollution treatment, Effluents, Regulation lation

Identifiers: *Seafood, Tuna.

Findings are presented of a study of the seafood processing industry for the purpose of developing effluent limitation guidelines. The seafood processing plants included in this study were those

processing farm-raised catfish, crab, shrimp, and tuna. Effluent limitation guidelines are presented for the degree of effluent reduction attainable through the application of the best practicable con-trol technology currently available and the best trol technology currently available and the best available technology economically achievable, which must be implemented by existing point sources by July 1, 1977, and July 1, 1983, respectively, Supportive data and rationale and rationale for development of the effluent limitation guidelines and standards of performance are presented. Processing techniques, wastes, and waste treatment methods and their costs are discussed. (Witt-IPC)

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PETROLEUM REFINING POINT SOURCE CATEGORY,

Environmental Protection Agency, Washington, D.C. Effluent Guideines Div

M. Halper

Available from the National Technical Informa ion Service, Springfield, Va 22161, as PB-238 612, \$7.75 in paper copy, \$2.25 in microfiche. EPA Report 440/1-74-014-a, April, 1974. 209 p, 7 fig, 75 ref, 57 tab. 68-01-0598.

Descriptors: *Oil industry, *Waste water treatment, *Water quality standards, Water pollution control, Capital costs, Operating costs, Costs, Wastes, Industrial wastes, Water pollution sources, Water quality, Standards, Economics, Effluent, Regulation. Identifiers: *Petroleum refining.

A study of the petroleum refining industry led to the development of effluent limitation guidelines, standards of performance, and pretreatment standards for the industry. The effluent limitation guidelines presented set forth the degree of reduction of pollutants in effluents that is attainable through the application of the best practicable control technology currently available and through the triol technology currently available and through the application of the best available technology economically achievable, which must be achieved by existing point sources by July 1, 1977, and July 1, 1983, respectively. Annual costs to the petrole-um refining industry for achieving these levels of pollution reduction are estimated. Supporting data and rationale for the development of the proposed effluent limitation guidelines and standards of per-formance are given. (Witt-IPC) W76-01238

HYDROGEOLOGIC EVALUATION OF SOLID WASTE DISPOSAL IN SOUTH CENTRAL WISCONSIN.

Wisconsin Dept. of Natural Resources, Madison. A. Zaporozec. Technical Bulletin No 78, 1974. 32 p, 5 fig, 9 tab,

20 ref, 1 append.

Descriptors: *Solid wastes, *Landfills, *Sites, Descriptors: "Solid wastes, "Landfills, "Sites, "Wisconsin, Hydrogeology, Leachate, Waste disposal, Environmental effects, On-site in-vestigations, Evaluation, Groundwater, Water table, Soils, Garbage dumps, Water pollution sources, Water pollution control, Geologic con-trol, Groundwater movement, Permeability, Topography, Groundwater recharge, Classifica-

Identifiers: *Criteria, Guidelines.

The conditions of 62 solid waste disposal sites in 10 counties of south central Wisconsin were examined. The evaluation concentrated on physical environments of the existing land disposal sites and their potential for pollution of water resources. Generally, the physical environment offers good natural protection against undesirable effects of landfilling. Landfills can be constructed in almost any of the hydrogeologic environments in south central Wisconsin, provided that a suitable design is used for each particular environment. Typical hydrogeologic environments were identified and classified into 10 groups. Three factors were used for the classification of hydrogeologic environments: (1) the extent and character of surficial deposits, (2) the position of the site in the ground water flow system and (3) depth to water table. A set of criteria useful in siting sanitary landfills in south central Wisconsin was established and examined on a number of sites to see how the criteria related to local conditions. The criteria used were: (1) type of unconsolidated sediments. (2) thickness of unconsolidated sediments, (3) depth to water table, (4) position of the site in the ground water flow, (5) type of bedrock, and (6) topography. Data needed for the evaluation of a site and the rating of their importance, along with a suggested procedure for evaluating environ-mental impact, were presented. (Visocky-ISWS) W76-01273

TECHNICAL AND ECONOMIC OPTIMIZA-TION OF REGIONAL WASTEWATER
MANAGEMENT (TECHNISCHE UND
WIRTSCHAFTLICHE OPERIMIERUNG BEI
DER BILDUNG VON ZWECKVERBAENDEN
ZUR ABWASSERBESEITIGUNG), H. H. Hahn, and P. M. Meier.

Praxis der Umwelthygiene, Vol 5, p 352-368, 1972. 6 fig, 1 tab, 14 ref. (Presented at the International Congress PRO AQUA-PRO VITA, Basel, Swit-

Descriptors: *Mathematical models, *Treatment facilities, Construction, Hydraulic transportation, Linear programming, Networks, Water resources development, Cost analysis. Identifiers: Regional waste water management.

A rational method for the optimization of regional waste water management systems is developed on the basis of a mathematical model and its subsequent optimization using modern techniques of operations research. However, the economies of scale in interceptor and treatment facility construction and the nonlinearity of hydraulic pipe flow regimes preclude optimization by conventional mathematical programming, since the resulting objective functions are concave. Well proven methods such as linear programming or solution by graph-theoretical analysis are thus inappropriate. Formulation as a fixed-charge problem results in a mixed interger-continuous variable linear programming problem, for which solution algorithms are to date insufficiently proven for general application. Solutions proposed generally exploit the unique structure of the location problem, yet hydraulic transportation networks cannot be treated by such existing methods. An implicit enumeration scheme is proposed to locate the optimum solution utilizing a branch and bound method as a search strategy. Preliminary results compare favorably to the traditional expedient of sequential technical and economic analysis, whereby a prior selection of feasible solutions is determined on the basis of empirical engineering judgment and subsequently subjected to cost anal-ysis. (Sandoski-FIRL) W76-01277

DISPOSAL OF DOMESTIC WASTEWATER BY HILLSIDE SPRAYS,
California State Dept. of Public Health, Berkeley.
Bureau of Sanitary Engineering.

For primary bibliographic entry see Field 5E. W76-01295

WATER RESOURCES PLANNING. For primary bibliographic entry see Field 6B. W76-01328 ENVIRONMENTAL IMPACT STATEMENTS IN PLANNING WATER AND RELATED LAND RESOURCES,

State Univ. of New York at Syracuse. Coll. of Environmental Sciences and Forestry.
For primary bibliographic entry see Field 6G.

STOCHASTIC ANALYSIS AND CONTROL OF URBAN ESTUARINE WATER-QUALITY SYSTEMS: VOL 1--ESTIMATION AND PREDIC-

New York City, Rand Inst. N.Y. S. K. Liu.

R-1622-NYC, The New York City Rand Institute, New York, December 1974. 47 fig, 7 tab, 114 equ, 27 ref, 4 appen, 110 p.

Descriptors: *Water quality control, *Estuarine environment, *Urban hydrology, *Urban drainage, *Stochastic processes, *Estimating, *Simulation analysis, Behavior. systems, Storm water, Water quantity, Pollutants, Overflow, Coliforms, Mathematical models, Equations, Systems analysis, Fourier analysis,

*Forecasting.
Identifiers: Jamaica Bay(New York), Nonparametric cross-spectral method, Stochastic noise components.

Described are the interrelationships among the major components of a typical urban estuarine interactive water-quality system. The nonparametric cross-spectral method was used to analyze the responsive behavior between the rainfall and the quantity and quality of the resulting overflow, as well as the characteristics of the stochastic noise components of several drainage systems. All impulse response kernels of the resulting overflow pollutant concentration had a basic W-shaped curve, indicating the relative importance of surface washing, conduit dilution, and bottom scour-ing. An equation for predicting transient coliform densities in a storm/sanitary combined system overflow was derived based on the interrelationship between the quantity and quality of the internal flow system. The prediction function from rainfall to overflow estimated by the spectral method was also compared with that obtained by direct transformation using the fast Fourier transform method. The prediction functions and coliform equations were used to develop urban drainage models for estimating the quantity and quality of discharges from the peripheral drainage systems of Jamaica Bay, New York City. These models were then used (with a two-dimensional estuarine water-quality model of the bay) for simulating water-quality results from two summer storms occurring during 1972 and 1973. Control processes in urban estuarine water-quality systems should be based upon a feed-forward scheme that uses predictive functions, since most of the parameters governing control are not mea-surable in real time. (Bell-Cornell) W76-01340

WATER QUALITY AND PLANNING MUST BE UNITED, RESOURCES Gilbert J.B. and Associates, Berkeley, Calif.

J. B. Gilbert, and W. J. Miller.

Water and Wastes Engineering, Vol 12, No 2, p 20-23. February 1975, 4 fig.

Descriptors: *Water quality, Water resources, *Water management(Applied), *Water management(Administrative), *Water pollution, *Water water management(Appined), water manage-ment(Administrative), "Water pollution, "Water supply, Streamflow, Salinity, Irrigation water, Groundwater, Algae, Fish migration, Reservoirs, River basin development, "California, Planning, Colorado River, Federal Water Pollution Control Act.

Identifiers: *San Joaquin River(Calif), *San Francisca Bay(Calif), *Sacramento-San Joaquin Delta(Calif), *Livermore Valley(Calif), *Alameda Creek(Calif), Niles Cone groundwater basin(Calif), Peripheral Canal(Calif).

In the United States water quality and water resources management have largely been un-dertaken separately. In times of water shortage, integration of these two study areas is needed to insure water supplies. Examples of water management involving San Francisco Bay and Sacramen-to-San Joaquin Delta (Calif), the Colorado River (Calif), the San Joaquin River (Calif), and Liver-more Valley (Calif) are cited. In the latter case wastewater flows with concentrations of 700 to 1000 mg/1 of salt occur in Alameda Creek (Calif) after municipal/industrial use adds 400 to 500 mg/1 of salt to the water. During the dry season this has a detrimental effect on the Niles Cone groundwater basin downstream and would eventually degrade these waters. The best solution appears to be to build a reservoir to store salty waters to be released in times of high streamflow. A water quality problem is thus solved through water resource management. Efforts at unification of these management fields have been made by the National Water Commission, the Federal Water Pollution Act of 1972, Interim Basin Planning in California, the California State Water Resources Control Board and the Federal Bureau of Recla-mation. The Federal Water Pollution Control Act Amendments of 1972 should be strengthened, or water resources and water quality planning should be undertaken by the Environmental Protection Administration, the Bureau of Reclamation and the Corps of Engineers. Also, state efforts, amendments to federal law, and expansion of state water rights authority are needed. (Smith-North Carolina W76-01343

PRIORITIES IN WATER MANAGEMENT. Victoria Univ. (British Columbia). Dept. of Geog-

For primary bibliographic entry see Field 6B. W76-01347

ENVIRONMENTAL HAZARDS OF LARGE SCALE WATER DEVELOPMENTS, Geological Survey, Raleigh, N.C. For primary bibliographic entry see Field 6G. W76-01348

RESEARCH ISSUES IN WATER QUALITY

MANAGEMENT, British Columbia Univ., Vancouver. Westwater Research Centre.
A. H. J. Dorcey, and I. K. Fox.

In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 63-77, 1 fig, 1 tab, 13 ref. 1974.

Descriptors: *Research and development, *Comprehensive planning, Water resources development, *Research priorities, *Multi-pur-pose projects, Political aspects, *Institutional constraints, Management, Waterquality, *Canada. Identifiers: Water quality management, *Lower Fraser River Research Project(Canada).

The usefulness of much of the research on the design of appropriate policies and institutional arrangements for water quality management is questioned. Some major limitations in research are suggested and several types of research that appear to merit greater emphasis are proposed. Some neglected proposals include: (1) the establishment of regional agencies; (2) utilization of effluent charges; (3) development of better techniques for evaluating alternative solutions; and (4) the in-tegration of water quality management into the neral task of residuals management. Decision makers follow more politically satisfying policies such as increased national management and national standards, limited regulations, and increased subsidies to induce desired behavior by waste discharges. To bridge the gap between research and policy making, new directions in research must be taken: larger number of inter-

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

disciplinary studies of regional situations, studies on behavioral aspects of water quality management, and inclusion of problem perceptions of the public and official decision makers in research designs. The Lower Fraser River Research Project provides a model of communication between the research team and various water quality manage-ment interests. The study outlines physical, behavioral, economic and technical properties to be used with normative criteria to evaluate exist-ing institutional arrangements for water quality management, formulate improvements and evalu ate alternative institutional designs. (See also W76-01347) (Salzman-North Carolina) W76-01351

DECISION TO CONTROL EUTROPHICATION. Canada Centre for Inland Waters. Burlington (Ontario). T. R. Lee.

In: Priorities in Water Management, Western Geo-graphical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 79-97, 1 fig, 2 tab, 36 ref. 1974

Descriptors: *Planning, *Water quality standards, Water policy, "International Joint Commission, *International commissions, "Great Lakes Region, "Eutrophication, "Phosphorous compounds, Water quality, Federal government, Great Lakes, Canada, United States, "Nitrilotriacetic acid. Identifiers: Water quality management.

Following the issuance of a report which disclosed that phosphorous caused high levels of eutrophica-tion in the Lower Great Lakes, the International Joint Commission (IJC) recommended specific water quality objectives which called for more public participation in the decision-making process and more public control of water quality. Sub sequent events and constraints that exist on the authority of international institutions are discussed. The IJC advised public regulation of industry for the preservation of environmental quali-ty. Although much of the IJC's report was supported on both sides of the lakes, divergences appeared between the U.S. and Canada concerning enforcement of the recommendations and emphasized the lack of authority in an international water management agency. As Canada quickly banned the manufacture, use, sale or import of phosphorous, the U.S. took no action, allowing the Great Lake states to legislate their own programs. A substitute, tri-sodium salt of nitrilotriacetic acid (NTA) was recommended by the commission and accepted for use by Canada; again, the U.S. refused support claiming that all environmental effects of NTA were unknown. Failure to agree on management strategies and water quality standards emphasized the opinion conflict between the two countries. The relationship between management of environmental quality and the decision-making structures needs examination. The eutrophication question suggests that the IJC has not been a suitable model for international environmental management. (See also W76-01347) (Salzman-North Carolina)

USER RESPONSE TO WATER QUALITY AND WATER-BASED RECREATION IN THE QU'APPELLE VALLEY, SASKATCHEWAN, Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.

J. G. M. Parkes.

In: Priorities in Water Management, Western Geo-graphical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 99-112, 2 fig. 8 tab, 8 ref. 1974.

Descriptors: Planning, "Future planning, "Decision making, Social aspects, "Non-structural alternatives, "Water quality control, "Attitudes, "Recreation, Research priorities, Water management, Behavior, "Canada.

Identifiers: Qu'Appelle Lakes(Saskatchewan), Saskatchewan.

A perception and attitude study which measures A perception and attitude study which measures the behavioral response of a population to a specific set of phenomena can aid in assessing public views and in helping to estimate social costs incurred by changes in the environment. This study of 4 recreational Qu'Appelle Valley lakes and their adjacent areas examines how present level of water quality influences recreation and determines the extent of people's willingness to pay for improvements in water quality. Two sam-pling procedures were used: a water quality sampling procedures were used: a water quanty sampling enabled a comparison to be made over time of the water's physical condition with the public perception of its quality which was ascertained by a sampling of 560 recreation users and 240 shoreline cottage residents. Results indicated that waters met accepted quality criteria. The user survey showed that a high desire for water quality was enough to cause significant reduction in recreational uses. To improve the quality of water, users expressed a willingness to pay a high amount per user per day per season, particularly at lakes with poorest quality. In weighing water use de-mands against each other and determining op-timum water quality levels, the decision-maker can employ user perception and attitudinal studies to aid in the final choice. More research is needed to determine the acceptable water quality criteria for recreation and to assess the value of this type of survey regarding public involvement process in planning. (See also W76-01347) (Salzman-North Carolina) W76-01353

THE ROLE OF THE PUBLIC IN DECISION-MAKING

Wisconsin Univ., Madison. For primary bibliographic entry see Field 6B. W76-01357

WATER POLLUTION LAWS AND REGULA-

Missouri Univ., Columbia. Dept. of Agricultural Ecnomics

C. G. McNabb, and D. R. Levi. Science and Technology Guide, Missouri University Columbia Extension Division, May, 1969, 4 p.

Descriptors: *Water pollution control, *Regulations, *Missouri, *Permits, Water law. Legislation, Water policy. Identifiers: Civil courts, Injunction, Fines

Two approaches for resolution and prevention of the Missouri water pollution problem are (1) through the Water Pollution Board and (2) through the civil courts. In 1957 the Missouri Legilature established the Water Pollution Board, defined water pollution, and adopted a state water policy the board must regulate. The board authorized to take legal action against pollution in a number of ways-by fines, by tax bills, by authorization to the Attorney General to bring suit against violators, and by withholding construction permits when proposed waste treatment facilities are inadequate. A permit was to be required for any person wanting to construct, install, or modify wastes into waters of the state. A person causing pollution may be sued for (1) an injunction, (2) damages, or (3) both an injunction and damages as a civil remedy to temporary or permanent nuisances. (Battles-East Central Oklahoma State) W76-01375

LOCATING A NEW FEEDLOT. Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 5B.
W76-01383

CURRENT LIVESTOCK POLLUTION REGU-LATIONS,

L. Lubinus, and F. Kerr.
Cooperative Extension Service, South Dakota
State University, Brookings, August 1974, 5 p.

Descriptors: *Water pollution, *Livestock, Water quality standards. Identifiers: *Point source pollution, assistance, Feedlot effluent standards.

Public-Law 92-500 amended the Federal Water Pollution Control Act and was enacted October 18, 1972. It prohibits the discharge of pollutants (including livestock wastes) into any stream, lake or river from a point source without a permit issued from one of two offices. These permits are issued by the Federal Environmental Protection Agency's (EPA) regional office in Denver, Colorado, or from the South Dakota Department of Environmental Protection (DEP). The term 'point source' is defined in terms of large and small feeding facilities using the type and number of animals to define the size. The NPDES (National Pollution Discharge Elimination System) is in charge of the permit program at the national level. Instructions of how and where to apply for a permit are given. Feedlot effluent standards, costsharing programs and technical assistance are briefly discussed. (Kehl-East Central Oklahoma State) W76-01385

EPA AND THE LIVESTOCK FEEDER.

National Livestock Feeders Association, Omaha, Nehr. B. Jones Agricultural Engineering, Vol 55, No 3, p 30-31,

Descriptors: *Livestock, *Feed lots, *Water pollution control, *Costs, *Regulation, Runoff, Iowa, Farm wastes.

Identifiers: Tenant farmers.

March, 1974, 2 fig.

Livestock operators are faced with many installation and maintenance costs in maintaining adequate pollution control facilities. One of the problems is that such investments are not costreducing or production-increasing. An initial installation investment for surface runoff control facilities of over \$700 million would be required for beef cattle, hog, lamb and dairy control facilities in the U.S. in order to meet regulations requiring the containment of surface runoff from a 10year, 24-hr storm. Livestock operators usually must absorb cost increases. The cost of implementing environmental regulations may prove the exception if many producers are forced out of business. (Cartmell-East Central Oklahoma State) W76-01388

IMPACT OF ENVIRONMENTAL REGULATION ON THE LIVESTOCK INDUSTRY,
National Livestock Feeders Association, Omaha,

Presented at 1973 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 11-14, 1973, Paper No 73-5531, American Society of Agricultural Engineers, St. Joseph, Michigan. 9 p.

Descriptors: *Regulation, *Feed lots, *Costs, Livestock, *Farm wastes, *Water quality standards, *Environmental effects.

Proposed guidelines and the effect they could have on the stability of rural economics, production costs, supplies of animal products, and consumer prices are discussed. In terms of price increases and overall industry capacity, the economic impact of the proposed effluent guidelines for feedlots would not be serious. The impact of environmental regulation will fall mostly on the small operator. It is said that many of these will be forced out of business. The industry may be pushed toward the middle of the road in terms of the unit size of operation. It is important to consider that environmental control expenditure does not generate additional cash flow or new income opportunities. Such investments are not cost-

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reducing or production-increasing. In fact, they are costcreating, since they give rise to additional maintenance and other operational costs.

(Cartmell-East Central Oklahoma State)

INFORMER FEES UNDER THE REFUSE ACT: DECIDING WHO GETS WHAT, For primary bibliographic entry see Field 6E. W76-01392

DEPARTMENT OF ENVIRONMENTAL PRO-TECTION V JERSEY CENTRAL POWER AND LIGHT CO. (DAMAGES FOR FISH KILL FROM DISCHARGE OF COLD WATER INOT NOR-MALLY WARMED WATER), For primary bibliographic entry see Field 6E. W76-01394

OPTIMAL ENVIRONMENTAL JURISDIC-Roosevelt Univ., Chicago, Ill. For primary bibliographic entry see Field 6E.

NATIONAL OIL AND HAZARDOUS SUB-STANCES POLLUTION CONTINGENCY PLAN. Council on Environmental Quality, Washington,

Federal Register, Vol 40, No 28, p 6282-6302, February 10, 1975.

Descriptors: *Oil spills, *Disasters, *Comprehensive planning, *Hazards, Oil wastes, Oil pollution, Safety, Inter-agency cooperation, Coordination, Control, Scheduling, Management, Water pollution effects, Control systems, Water pollution, Water pollution control, Water pollution sources, Water pollution treatment.

sources, water pointion treatment.
Identifiers: Hazardous spill emergencies,
Hazardous substances(Pollution), Administrative
regulations, Coastal waters, Contiguous zone,
Territorial waters.

This plan provides for a pattern of coordinated and integrated response by several departments and agencies of the Federal government to protect the environment from the damaging effects of pollution discharges. The objective is to provide efficient, coordinated and effective action to minimize damage from discharges of oil and other hazardous substances, through containment, dispersal and removal. The plan governs the navigable waters of the United States, adjoining shorelines, the contiguous zone, and the high seas where a threat to the United States waters, shoreface, or shelf-bottom exists. The primary thrust of the plan is to provide a coordinated response at the scene of an unplanned or sudden discharge of oil or hazardous substance that threatens the public health or welfare. Detailed plans are presented concerning each agency or de-partment's role, response, and authority in the event of an actual emergency. (Hoffman-Florida) W76-01399

A PRIMER ON THE BOUNDARY WATERS TREATY AND THE INTERNATIONAL JOINT COMMISSION.

For primary bibliographic entry see Field 6E. W76-01400

LEGAL REMEDIES FOR POLLUTION ABATE-

MENT, Missouri Univ., Columbia.

D. R. Levi, and D. Colyer. Science, Vol 175, p 1085-1087, March 10, 1972. 30

Descriptors: *Pollution abatement, *Natural aspects, *Remedies, *Legal as aspects, *Remedies, Environmental

Planning, Pollution, Common law, Industrial wastes, Conservation, Water resources, Administration, Judicial decisions, Preservation, Protection, Legislation, Trespass, Damages, Riparian rights, Prior appropriation.

Identifiers: *Nuisance(Legal aspects), Injunctive

If the exploitation of natural resources is to stop, the legal structure must be conducive to that goal. Legal remedies are available for the use of individuals or groups in attacking specific acts of pollution or proposals deemed destructive to the environment. In disposing of the residues of production and consumption, the polluter makes use of free, often scarce resources including air and water, the costs of which are imposed on society. Because of the multifarious interests involved in the solution of pollution problems, solu-tions are not reached with optimal efficiency. Individuals have little input into legislative and administrative processes. More influence is likely to be exerted through litigation. Court action often results in the halting of pollution, or potential pollution with relatively little delay. Also, the uncertainty involved in litigation may breed in pollutors insecurities which could lead to rational planning and development. (Sperling-Florida) W76-01403

CEMENT PRODUCERS CONFRONT ANTI-POLLUTION LEGISLATION,
For primary bibliographic entry see Field 6E.

W76-01404

MARTIN-TRIGONA RUCKELSHAUS (CHALLENGE OF EXECUTIVE IMPOUND-MENT OF FWPCA FUNDS). For primary bibliographic entry see Field 6E. W76-01405

AMERICAN PLANT FOOD CORP. V. STATE OF TEXAS (APPEAL FROM CRIMINAL CONVICTION FOR POLLUTION OF WATERS). For primary bibliographic entry see Field 6E W76-01407

CONTROL OF THE POLLUTION OF SURFACE WATER BODIES (BESTRIJDING VERON-TREININGING OPPERVLAKTEWATER), For primary bibliographic entry see Field 5D. W76-01452

BIOLOGICAL CONTROL OF ALLIGATOR WEED, Office of the Chief of Engineers (Army), Washing-

ton, D.C. Aquatic Plant Control Program. For primary bibliographic entry see Field 4A. W76-01495

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

WATER RIGHTS AND WATER QUALITY MANAGEMENT, Virginia Polytechnic Inst. and State Univ.,

Blacksburg. Water Resources Research Center. For primary bibliographic entry see Field 5G. W76-01001

AN OPTIMIZATION MODEL FOR BALANCING ECONOMIC-ENVIRONMENTAL SYSTEMS, McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics. For primary bibliographic entry see Field 5G. W76-01002

FEDERAL-STATE RELATIONS IN WATER QUALITY PLANNING, Pennsylvania Dept. of Environmental Resources,

Harrisburg. For primary bibliographic entry see Field 5G. W76-01003

WATER SUPPLIES FOR LOW-INCOME COM-MUNITIES IN DEVELOPING COUNTRIES, Birmingham Univ. (England) Dept. of Civil Engineering. For primary bibliographic entry see Field 5G. W76-01004

FORMULATION AND USE OF PRACTICAL MODELS FOR RIVER QUALITY ASSESS-MENT, Geological

Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 5G. W76-01006

COMPUTER ASSISTED PROCEDURES IN WATER PROJECT EVALUATION, International Inst. for Applied Systems Analysis,

Laxenburg (Austria). I. Belyaev, and I. Zimin. Research Report, RR-75-27, August 1975. 32 p. 8

fig, 11 ref.

Descriptors: *Water resources, *Projects, *Methodology, *Simulation analysis, *Evaluation, *Systems analysis, Computers, Investment, Capital, Economics, Optimization, Water demand, Regions, Planning, Decision making, Net-works, River basins, Canals, Constraints, Hydrology, Water management(Applied), Hydrology, Water management specific Scheduling, Long-range planning, Alternative plannong, Algorithms, Equations, Mathematical plannong, Algorithms, Equations, Mathematical models, Damages. Identifiers: *Water economy, Hydrotechnical

structures.

Described is a methodology for solving water economy capital investment problems concerning water economy expansion to meet an increasing demand for municipal, industrial, and other uses within giver resource limitations. Considered is simulation system development, a technique for chossing the rational project variant. A water economy is an individual branch of a region, its connections and interactions with other branches of that region accounted for. The interaction of the regional management (Center) and the branch manager takes place within the framework of a centralized hierarchical system. The Center distributes the resources among managers of separate branches. The information a manager receives may be represented by the vector function of resources C(t) during the planning period. Outout information is a scalar function, which characterizes the loss to the branch if it is not sufficiently supplied with hydrotechnical structures. The first phase of the decision-making process is formulating all feasible alternatives for development of a given regional water management system. The second phase is calculating all versions of the development program for the branch. The third phase is estimating the loss which the branch may incur with a given program of branch development. The latter two phases are provided with ap gorithms. (Bell-Cornell) W76-01007 propriate mathematical models and numerical al-

SOME SYSTEMS CONCEPTS FOR URBAN

PLANNING, Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Building Research.

Royal Australian Planning Institute Journal, Vol 12, No 2, p 43-50, April 1974. 6 fig, 2 tab, 9 ref.

Field 6-WATER RESOURCES PLANNING

Group 6A-Techniques Of Planning

Descriptors: *Urbanization, *Planning, *Design, *Environmental control, *Economics, Water resources, Costs, Benefits, Pricing, Optimum development plans, Ecology, Recreation, Transportation, Roads, Decision making, Model studies, Systems analysis.

Identifiers: *Urban environment, *Natural environment, Urban development, Environmental quality. Minimal disturbance.

Various concepts concerning the characteristics of an urban system and ways in which they may be utilized in planning are discussed. One concept considers both the disturbance caused to natural systems and the necessary correction of that disturbance. The costs of each are noted to be strongly correlated, leading to the concept that minimal disturbancd requires minimal correction and results in minimal overall cost. Use of the natural environment as a control on urban environment is also discussed. The concept that the whole can be greater than the sum of the parts is used in grouping related components to form a larger subsystem, with greater overall ratio of benefits to costs. A water resources system is considered in particular. The larger sub-system may have a hierarchial structure which may also be used in planning for its improvement. The road system is considered as an example and potential benefits are discussed. Another characteristic is that some sub-systems are complementary whereas others compete, and the economic implications of this are noted. A study of the distribution of total costs of a system may further indicate where beneficial tradeoffs may occur. The use of pricing to implement an optimal plan is considered. Recommendations arising from the above concepts are presented. The above considerations may be introduced as part of a comprehensive approach to urban planning and design. (Bell-Cornell) W76-01008

ENGINEERING THE BEAR SWAMP PROJECT, Main (Charles T.) Inc., Boston, Mass. R. W. Kwiatkowski, and D. R. Campbell. Journal of the Boston Society of Civil Engineers, Vol 61, No 3, p 132-165, July 1974. 15 fig.

Descriptors: *Pumped storage, *Projects, *Reservoirs, *Hydrologic aspects, Civil engineering, Structures, Rivers, Operations, Simulation analysis, Massachusetts. Identifiers: *Bear Swamp Project(Mass.), Deerfield River(Mass.)

Considered are some of the principal civil engineering features of the Bear Swamp Pumped Storage Project, located on the Deerfield River in the northwestern corner of Massachusetts, and owned by the New England Power Company. An understanding of the overall project is conveyed in general terms by relating a brief history of the project background together with the most salient of the hydrological aspects, and a broad description of the various project structures. Considered are Deerfield River, plant operation, permits, geology, simulation model studies, the lower and upper reservoirs, reservoir level control, tunnels, the Bear Swamp powerhouse, the Fife Brook powerhouse, diversion, and quaity control. It is concluded that the project has been well designed and constructed and that its operation should be fully satisfactory. (Bell-Cornell) W76-01010

THE INTEGRATED MULTI-MEDIA POLLU-

Georgetown Univ., Washington, D.C. Dept. of Economics. For primary bibliographic entry see Field 5G. W76-01013 STRUCTURING COMMUNICATIONS PROGRAMS FOR PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING, Utah State Univ., Logan, Dept. of Civil and En-

vironmental Engineering.

A. B. Bishop.

Available from the National Technical Information Service, Springfield, Va 22161. IWR Contract Report 75-2, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, May 1975. 125 p, 22 fig, 3 tab, 27 ref.

Descriptors: *Water resources, *Planning, *Management, *Communication, Programs, Decision making, Information exchange, Methodology, Alternative planning, Evaluation, Model studies, River basins, Water quality. Identifiers: *Public participation, *Interactive planning, Impact assessments.

Federal legislation has demand broad public involvement in water resource planning and management. In response, agencies have promulgated polprocess which incorporates a program of citizen involvement throughout. Provided for are public disclosure of information, public hearings, soliciting feedback for management decisions, etc. Although the public's role in water resource planning and management is well established, with planners responding to an enlightened citizenry, many citizens and interest groups are often excluded from meaningful participation. There is a need for continually improving interaction between planner, decision makers, and concerned public interests. Methods and techniques for lanner-citizen communication which will enhance the level of public participation in the planning process and permit citizens and planners to work effectively together in arriving at decisions which affect multiple local, state, and federal jurisdictions. Considered are: (1) dynamics of the planning process, including information generation, problem identification, formulation of alternatives, impact assessment, and evaluation; and (2) communication, including communications process models, techniques for public involvement, structuring of communication programs, and an example river basin water quality management and planning problem. Water resources planners need programs through which citizens contribute most constructively to formulating proposed plans, assessing their economic environmental and social impacts, and selecting the best course of action. (Bell-Cornell)

WATER RESOURCES DECISION MAKING ON THE BASIS OF THE PUBLIC INTEREST,

Stanford Univ., Calif. Dept. of Civil Engineering. L. Ortolano.

Available from the National Technical Information Service, Springfield, Va 22161. IWR Contract Report 75-1, U.S. Army Institute for Water Resources, Fort Belvoir, Virginia, February 1975. 53 p, 4 fig, 1 tab, 37 ref, 2 append. DACW73-73-C-0046.

Descriptors: *Water resources, *Planning, Decision making, Economic efficiency, Cost-benefit ratio, River basins, Alternative planning, Water law, Evaluation, Constraints, Flood control, Systems analysis.

Identifiers: *Public interest, *Public involvement, Pre-authorization studies, Multiple-objective planning, Weights, Factors, Impact analysis, Plan ranking, Field level planning, Alternatives, Environmental quality.

The concept of water resources decision making in the public interest is both fundamental and elusive. Alternative prespectives that have been suggested for defining the public interest are discussed and an overview is presented of the decision making involved in a typical water resources planning study. Various approaches to determining the public interest in pre-authorization planning and

decision making are examined. An argument is presented in support of current trends away from reliance on economic efficiency as a basis for defining the public interest and toward the direct involvement of citizens in determining the factors and weights used in defining the public interest. The argument proceeds in three principal parts, each of which constitutes a chapter. After definition of the public interest and the nature of decision making in pre-authorization studies, Chapter Two focuses on the economic efficiency criterion for ranking alternative actions; it elaborates on benefit-cost analysis as an application for the efficiency criterion and on the ways in which the criterion was generally applied in pre-authorization studies during the 1960's. In Chapter Three recent techniques for ranking alternatives on the basis of multiple objectives are discussed in terms of how and by whom the factors and weights are determined. Chapter Four describes a process for integrating public involvement into the determination of factors and weights. Appended for illustration is Manheim's process for highway planning.
(Bell-Cornell) W76-01015

WATER RESOURCE SYSTEMS AND RELA-TIONS, Clark Univ., Worcester, Mass. Dept. of Environ-

mental Affairs.
For primary bibliographic entry see Field 2A.
W76-01118

OPTIMIZING INFORMATION TRANSFER IN A STREAM-GAGING NETWORK, Geological Survey, Reston, Va. For primary bibliographic entry see Field 7A.

NEEDS AND PLANS IN THE DEVELOPMENT OF URBAN AND RURAL SEWER SYSTEMS (POTRZEBY I PLANY ROZBUDOWY SIECI KANALIZACYJNEI W MIASTACH I OSIĘDI ACH)

OSIEDLACH),
For primary bibliographic entry see Field 8A.
W76-01294

THE WEIBULL PROBABILITY ASSIGNMENT TECHNIQUE: AN APPLICATION TO BENEFIT-COST ANALYSIS, California Univ., Santa Barbara. Dept. of

Economics.

W76-01187

L. J. Mercer, and W. D. Morgan. Water Resources Research, Vol 11, No 5, p 755-757, October 1975. 2 tab, 4 ref.

Descriptors: *Water importing, *Economic feasibility, *Cost-benefit analysis, *Probability, Projects, Timing, Water supply, Estimating, Statistics, Mathematical models, Systems analysis, California. Identifiers: *Weibull distribution, *Santa Barbara

County(Calif), Uncertainty.

The flexibility of the Weibull distribution and the information gain made possible by its use to deal with the problem of uncertainty in benefit-cost analysis are illustrated by application to a benefit-cost study to determine the minimum feasible timing of water importation, i.e., the earliest point in time when water importation would be economically feasible, for Santa Barbara County. The estimate of minimum feasible timing is developed by constructing a general economic feasibility evaluation model using cost-benefit procedures. Measures of project costs, benefits, and various parameters and conditions, both behavioral and technical, are required to implement this model. The Weibull distribution requires few estimated variables and a minimum of information, is relatively simple to work with mathematically, and can approximate the whole variety of distributions which may characterize input variables in benefit cost analysis. Use of the Weibull distribution pro-

vides the standard deviation and central tendency measures of the output (net benefit, benefit-cost ratio, etc.) distribution in benefit-cost analysis as well as the probability of outcomes indicating a project is not economically feasible. The applica-tion reported shows that the use of the Weibull distribution is superior to the usual point estimates and sensitivity tests in benefit-cost analysis. (Bell-Cornell) W76-01331

APPROACHES TO MULTIOBJECTIVE PLANNING IN WATER RESOURCE PRO-JECTS.

Polytechnic Inst. and State Univ., Blacksburg. School of Business Administration. B. W. Taylor, III, K. R. Davis, and R. M. North. Water Resources Bulletin, Vol 11, No 5, p 999-1008, October 1975. 1 fig, 20 ref.

Descriptors: *Water resources, *Project planning, *Methodology, *Evaluation, Cost-benefit analysis, Decision making, Mathematical models, Systems analysis, Environment, Social aspects, Economics, Water pollution, Optimization. Identifiers: *Multiple-objective planning, Goal programming, Surrogate worth trade off method, Environmental Evaluation System(EES), Personal value determination, Noncommensurable objec-

Water resource agencies' attempts to include environmental and social (as well as economic) objectives in the evaluation process have not been very successful. This is due to the fact that benefit-cost analysis, the method commonly em-ployed, is too limited (as currently implemented) to accomodate the complexities presented by a multiple objective approach to water resource development. This article reviews several alternative approaches to water resource evaluation, discussing the advantages and limitations of each. The alternatives are categorized into two areas: mathematical programming and value determina-tion methods. In the mathematical programming area, two techniques are reviewed: goal programming and the surrogate worth trade off method. In the value determination area, Environmental Evaluation Systems (EES) and personal value determination are reviewed. While these methodologies are not all inclusive, they do represent an informative cross section of the direction of research in multiple objective decision making. It is concluded that no one methodology offers a complete solution to the evaluation problem; a combination of approaches need be employed. However, goal programming surfaces as the most workable approach, considering all objectives within a single model framework, with a minimum of complexity. (Bell-Cornell) W76-01335

MODELING OF FUTURE EXPENDITURES FOR PLANNING AND ECONOMIC EVALUATION OF ALTERNATIVES.

I. Koenig. Water Resources Bulletin, Vol 11, No 5, p 933-945, October 1975. 1 fig, 8 equ, 1 tab, 1 append.

Descriptors: *Water resources, *Projects, *Alternative planning, *Economics, *Evaluation, *Expenditures, Engineering, Long-term planning, Operating costs, Decision making, Mathematical models, Human population, Interceptor sewers, Equations, Design, Systems analysis. Identifiers: Prediction, Cost escalation, Linear, Logarithmic.

An analysis is made of current engineering practices in modeling future cash expenditures and reducing a series of them to present value so that economic comparisons may be made among alter-native schemes. Considered is project planning for an interceptor sewer system for an area in which the pattern of population density was predicted to change over future years of population growth.

The principles developed are applicable to any kind of engineering system or facility requiring economic decisions among alternatives with differing useful lives or differing profiles of cash ex-penditures over many years. Discussed herein are the reality and predictability of cost escalation, a beginning-of-period model versus an end-ofperiod model, the discount rate versus real interest rates, linear and logarithmic cost escalation, the present value of uniform periodic constant-dollar expenditures, cash flow in the post-project period, design into the post-project period, and con-tinuance of performance in the post-project period. Current practices are criticized and recommendations for improvements over conventional methods in the engineering economic analysis of alternatives with different multi-year profiles of expenditures are given. (Bell-Cornell) W76-01336

EFFICIENT SEQUENTIAL OPTIMIZATION IN WATER RESOURCES,

Iowa Univ., Iowa City, Inst. of Hydraulic Research. T. E. Croley, II.

No 69, Hydrology Papers, Colorado State University, Fort Collins, Colorado, September 1974. 31 p, 12 fig, 16 tab, 77 equ, 48 ref, 5 append.

Descriptors: *Water resources, *Optimization, *Reservoir operation, *Stochastic processes, Planning, Dynamic programming, Simulation analysis, Statistical methods, Costs, Equations, Mathematical models, Systems analysis. Identifiers: *Deterministic optimization techniques, *Stochastic optimization techniques, *Computation reduction, Data generation.

Reduction of computation effort in water resources optimization problems can be made through a modification of the optimization technique instead of through limiting development of the system models. Considerations are presented herein which lead to the development of a heuristic application of deterministic optimization techniques. The modification enables reduction of computation to take place while achieveing results that approximate the optimum. The modified application of dynamic programming is made for a single reservoir system problem to illustrate the technique and the achievement of near optimum performance. Stochastic optimization techniques that are used in water resource systems engineering are presented. A heuristic alternate engineering are presented. A learned alternate stochastic optimization technique is then described and suggested as an improvement. Feasible use of this alternate is possible since observations on planning horizons are employed in computation reduction. For a single reservoir system, the techniques are applied and compared. Computation costs are reduced and system per-formance is improved with the use of the alternate. Several studies are outlined which illustrate changes in the technique results with changes in the problem formulation. The techniques work well for all problem variations considered here: indicated is that the techniques perform best for realistic problem formulations. (Bell-Cornell) W76-01338

DETERMINATION OF URBAN WATERSHED RESPONSE TIME, Colorado State Univ., Fort Collins.

For primary bibliographic entry see Field 4D. W76-01339

STOCHASTIC ANALYSIS AND CONTROL OF URBAN ESTUARINE WATER-QUALITY SYSTEMS: VOL 1--ESTIMATION AND PREDIC-TION, New York City, Rand Inst. N.Y.

For primary bibliographic entry see Field 5G. W76-01340

THE ECONOMIC EFFICIENCY OF INTERBASIN AGRICULTURAL WATER TRANSFER IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH, Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan. For primary bibliographic entry see Field 4A. W76-01341

A SYSTEMS ANALYSIS OF A CONTINUOUS WATER QUALITY MONITORING PROJECT, Tennessee Univ., Knoxville. Water Resources Research Center. For primary bibliographic entry see Field 5A. W76-01342

6B. Evaluation Process

DESIGN GRAPHS FOR ACTIVATED SLUDGE PROCESS.

CH2M-Hill, Reston, Va.; and Hill (Clair A.) and Associates, Reston, Va. For primary bibliographic entry see Field 5D. W76-01005

COMPUTER ASSISTED PROCEDURES IN WATER PROJECT EVALUATION. International Inst. for Applied Systems Analysis, Laxenburg (Austria). For primary bibliographic entry see Field 6A. W76-01007

SOME SYSTEMS CONCEPTS FOR URBAN

PLANNING, Commonwealth Scientific and Industrial Research (Australia). Div. of Organization, Melbourne (Australia). Div. of Building Research. For primary bibliographic entry see Field 6A. W76-01008

QUANTITATIVE TECHNIQUES FOR EVALUATING THE ENVIRONMENTAL IMPACT OF TRANSPORTATION SYSTEMS, Sydney Area Transportation Study (Australia). For primary bibliographic entry see Field 4C.

WATER RESOURCES DECISION MAKING ON THE BASIS OF THE PUBLIC INTEREST, Stanford Univ., Calif. Dept. of Civil Engineering. For primary bibliographic entry see Field 6A. W76-01015

COGNITIVE STRAWMAN: PUBLIC INPUT TO A WATER RESOURCE PLANNING SYSTEM. Arizona Univ., Tucson. Dept. of Hydrology and Water Resources. R. M. Judge

Ph D Dissertation, 1975. 100 p, 9 fig, 14 tab, 53 ref.

Descriptors: *Water policy, *Water resources development, *Comprehensive planning, development, *Comprehensive planning,
*Planning, *Social aspects, Potential water
supply, Conservation, Methodology, Water
supply development, Project planning, Arizona,
Water resources, Water utilization.
Identifiers: Rio Grande Valley(New Mexico).

An information system was developed to facilitate input of public values and goals into planning and evaluation processes. The technique was then applied to subjects in Arizona and the Rio Grande Valley of New Mexico in a water resources planning study. Research indicated that community values can be input to the planning process by the use of disaggregated goal structure and the quantifying function. The general allocation technique, used in mail survey, shows promise as a means of discovering community preference and providing the necessary link between professional

Field 6-WATER RESOURCES PLANNING

Group 6B-Evaluation Process

and public goals for a water system. (McLachlan-Arizona) W76-01110

ON THE MARICULTURE OF THE FLORIDA SEAWEED, EUCHEUMA ISIFORME, University of South Florida, Tampa. Dept. of

Biology.

C.J. Dawes.

Available from the National Technical Information Service, Springfield, Va. 22161, as COM 7411698, \$3.50 in paper copy, \$2.25 in microfiche. Florida Sea Grant Program Report No 5, August 1974. 12 p, 1 fig. 15 ref.

Descriptors: *Aquiculture, *Marine algae, *Rhodophyta, Florida, Growth rates, Planting management, Feasibility studies, Economic feasibility, Operating costs, Carbohydrates, Ecological distribution.

Identifiers: Mariculture, Eucheuma isiforme, Carrageenan, Seaweeds.

Because seaweeds containing the phycocolloid carrageenan do not meet the demand, mariculture of Eucheuma isiforme in Florida is of interest. E. isiforme is common in the Florida Keys, is a perenninal, has the highest yield of carrageenan, and grows rapidly. To determine if Eucheuma can be grown in Florida under controlled conditions to obtain an economically feasible product, maricul-ture procedures in either natural embayments or in culture tanks are discussed. Mariculture of Eucheuma in natural embayments would be restricted to only 2-3 harvests per year, herbivores and storms could decrease yields, and mixtures with other seaweeds would reduce the value of the harvest; however operating costs would be low. Culture tanks would eliminate or lessen these problems and permit year-around harvesting. A much higher crop per unit area than field culture (\$9.72/sq m/yr compared to \$0.16/sq m/yr) would result, but expenses for tank construction, water circulation, and temperature control would be greater. From the present understanding of the ecology and biochemistry of E. isiforme, mariculture seems feasible, pending pilot plant studies. (Buchanan-Davidson--Wisconsin) W76-01151

WATER RESOURCES PLANNING,

O. Gibb.

Journal of the Institute of Water Pollution Control, Vol 74, No 3, p 262-276, 1975. 4 fig, 1 tab, 8 ref.

Descriptors: *Water resources development, *Comprehensive planning, *Long-term planning, water supply, *Water quality control, Conservation, Coordination, Demand, Effluents, Disposal, Pollution abatement, Water quantity, Water balance, Standards, Fisheries, Recreation, Land drainage, Navigation, Identifiers: *Multiple objectives.

A survey of comprehensive, long-term planning and the optimum use of water resources in Great Britain is presented. Needed are strategies to coordinate and fulfill multiple objectives at minimum cost, with water supply and conservation and effluent disposal and pollution control as primary considerations. Other objectives include preservation of fisheries, recreation and amenity, land drainage and flood protection, and navigation. The Water Act of 1973 provides the opportunity for multi-purpose water resources development in England and Wales. The creation of powerful water cuthorities responsible for all aspects of the water cycle in their designated river basin should ensure the optimum development within the limits of available finance. Survey results suggest that the reconciliation of objectives in the water supply and quality control fields, within financial constraints, may necessitate challenging traditional concepts of reliability of public supplies. While individual authorities will have their own priorities in allocation of available financial resources, it

seems essential that any move towards a change in traditional standards should receive general accptance throughout the whole industry. Furthermore, it would seem desirable that the implications of such changes should be spelt out clearly both for water supplies and the residual flows in rivers. (Bell-Cornell) W76-01328

WATER REUSE: A FLEXIBLE AND EFFICIENT MANAGEMENT ALTERNATIVE FOR MU-NICIPAL WATER SUPPLY, Butler Univ., Indianapolis, Ind. Holcomb

Research Inst.
For primary bibliographic entry see Field 5D.
W76-01330

THE WEIBULL PROBABILITY ASSIGNMENT TECHNIQUE: AN APPLICATION TO BENEFIT-COST ANALYSIS.

California Univ., Santa Barbara. Dept. of Economics. For primary bibliographic entry see Field 6A.

W76-01331

CITIZEN INFLUENCE IN WATER POLICY DECISIONS: CONTEXT, CONSTRAINTS, AND

ALTERNATIVES,
Washington State Univ., Pullman. Dept. of Politi-

cal Science. H. R. Doerksen, and J. C. Pierce. Water Resources Bulletin, Vol 11, No 5, p 953-

964, October 1975. 31 ref.

Descriptors: *Water policy, *Water resources, *Planning, Alternative planning, *Political aspects, Constraints, *Decision making, Social participation.

Identifiers: *Public participation, Conflicts, Models, Linkage.

The desirable proportion of citizen input into policy making and the proper mechanism for that input engender substantial conflict in the water resources arena. Nevertheless, discussions of citizen participation in water policy formation generally occur within narrow perspectives both with regard to the issues involved and the alternative mechanisms by which that participation can be realized. This paper examines the historical and current contexts of the controversies and presents a discussion of the alternative processes for citizen influence, called linkage. The linkage processes discussed include direct participation, citizen advisory committees, the pressure group model, the electoral model, and the bureaucratic model.Each linkage process is discussed in terms of who is considered the public, how the public influence works, the limitations of the process, and what available water policy-related data suggest regarding the adequacy of the process. (Bell-Cor-W76-01332

ENVIRONMENTAL IMPACT STATEMENTS IN PLANNING WATER AND RELATED LAND RESOURCES,

State Univ. of New York at Syracuse. Coll. of Environmental Sciences and Forestry.
For primary bibliographic entry see Field 6G.
W76-01333

APPROACHES TO MULTIOBJECTIVE PLANNING IN WATER RESOURCE PRO-

JECTS, Virginia Polytechnic Inst. and State Univ., Blacksburg. School of Business Administration. For primary bibliographic entry see Field 6A. W76-01335 MODELING OF FUTURE EXPENDITURES FOR PLANNING AND ECONOMIC EVALUATION OF ALTERNATIVES, For primary bibliographic entry see Field 6A. W76-01336

WATER QUALITY AND RESOURCES PLANNING MUST BE UNITED, Gilbert J.B. and Associates, Berkeley, Calif. For primary bibliographic entry see Field 5G. W76-01343

NONSTRUCTURAL MEASURES FOR FLOOD PLAIN AND FLOOD DAMAGE MANAGEMENT, WITH APPLICATION TO THE CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY, Cheney, Miller, Ellis and Associates, Inc.. Put-

nam, Conn. For primary bibliographic entry see Field 6F.

W76-01345

PRIORITIES IN WATER MANAGEMENT.

Victoria Univ. (British Columbia). Dept. of Geography.
Western Geographical Series, Vol 8, F.M. Leversedge, ed. University of Victoria, Victoria, British Columbia, 1974. 300 p, 15 fig, 19 plates, 27 tab.

Descriptors: *Water management(Applied), *Nonstructural alternatives, *Water supply development, Instrumentation, *Planning, *Water policy, Environmental engineering, *Water quality control, Water resources, *Pricing, Alternative water use, Potential water supply, Water conservation, Water pollution control, Cost-benefit analysis, Great Lakes, Management.

Identifiers: Tijuana River(U.S. Mex), Citizen participation.

The 13 papers in this volume develop the theme 'Water Resources Management: Traditions and Tasks' into 6 subject areas: Engineering Environmental Hazards; Hind-sight Evaluation; Water Quality Management; Water Pricing Policies; Institutions and the Public; and Planning and Policy-Making. Citing national and international case studies, a variety of water management issues, particularly evaluation and policy formulation, are explored. Planned versus realized cost-benefits of piored. Fianned versus realized cost-benefits of multipurpose projects becomes the focus of deal-ing with hindsight analysis. The papers discuss policy design and strategies of water quality management. Eutrophication control of the lower Great Lakes provides an example of the application of planning and decision-making possibilities of an international water body. 'Water Pricing Policies' explores the feasibility of replacing supply management with demand management throug the use of pricing policies such as seasonal pricing, peak load pricing and domestic water metering as alternatives to technological solutions. Guidelines for citizen participation in the decision-making process are developed from case studies which outline and evaluate established water management programs in the Great Lakes, Tijuana River and three U.S. rivers. In the last section, W.R. Sewell identifies basic water management problems, and then outlines strategies for planning, policy formulating and decision making. (See W76-01348 thru W76-01360) (Salzman-North Carolina) W76-01347

ENVIRONMENTAL HAZARDS OF LARGE SCALE WATER DEVELOPMENTS, Geological Survey, Raleigh, N.C. For primary bibliographic entry see Field 6G. W76-01348

BENEFIT-COST ANALYSIS AND MULTIPLE-PURPOSE RESERVOIRS: A REASSESSMENT OF THE CONSERVATION AUTHORITIES' BRANCH DEER CREEK PROJECT, ONTARIO, University of Western Ontario, London. I D. Dav.

In: Priorities in Water Management, Western Geo graphical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 23-35, 2 fig, 1 tab, 6 ref, 1974.

Descriptors: *Cost-benefit analysis, *Economics, *Feasibility studies, *Project planning, *Reservoirs, *Project benefits, Construction costs, Real benefits, Estimated benefits, Intangible benefits, Decision-making, Water policy, Identifiers: *Branch Deer Creek, Ontario.

Comparison of benefits and costs anticipated during the project planning in 1967, and a reassess-ment in 1971 of the Deer Creek reservoir and road. underlines the disparity between estimated costs and incurred costs as well as inaccurate assump-tions made by the analysts. Deer Creek watershed has forest and agricultural land of excessive soil moisture and low fertility. Anticipated primary benefits were a new road and increased farm productivity due to improved irrigation water availability. Intangible benefits would be increased domestic water supply, groundwater tables, recreation, firefighting, regional economic growth, and flood control opportunities. Originally estimated to cost \$579,000, the completed project costs had increased 15% to \$686,000. Erroneous calculations developed from not accounting for all initial costs (original feasibility study, \$8000; rise in land acquisition from \$5,000 to \$40,000; and rise in engineering fees from \$47,370 to \$84,000); assuming farmers' willingness to increase productivity and change crop selection patterns when surveys indicated otherwise; disregarding fact of existing ample water supply for domestic water uses, firefighting and livestock watering. The claim that the project would promote regional economic growth seems improbable. Although recreational opportunities did increase, final assessment in-dicates that only 44% of project costs were justified. Need for 56% of project expenses attributed to building of the road was not explained. Based on primary conservation benefits, the benefit-cost ratio of the Deer Creek project was 0:1 after 2 years of operation since farmers did not plant sufficient tobacco to claim minimum irrigation benefits. Assessing project feasibility is directly affected by inadequate review procedures and ineffective interagency coordination among governmental agencies. (See also W76-01347) (Salzman-North Carolina) W76-01349

VALUE CONFLICTS AND WATER SUPPLY DECISIONS.

Waterloo Univ. (Ontario). R Mitchell

B. Mitchell. In: Priorities in Water Management, Western Geo-graphical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 37-59, 1 fig. 35 ref. 1974.

Descriptors: *Reservoirs, Water resource development, *Decision making, *Governments, *Coordination, Psychological aspects, Social aspects, *Water supply development, Planning, Cost-benefit analysis, Social participation. Identifiers: Liverpool(UK) Tryweryn of Llyn Celyn Reservoir(UK), Wales(UK), Value conflicts, *United Kingdom.

Debate over construction of the Tryweryn of Llyn Celyn reservoir in Wales by the City of Liverpool emphasize the conflict situation concerning resource development. The controversy is reviewed to determine what lessons emerge from a resource development project in which values placed on different uses of water resources were in direct conflict. Tryweryn was perceived as a long term, large scale project which through scale economy savings would best satisfy increasing water demands of Liverpool. Opposition to the reservoir focused on the validity of the initial benefit-cost analysis, over-estimation of industrial needs and residential growth, and the exploition of Welsh resources. Environmental and social costs including damage to an already declining agricul-tural area, were not considered. A more equitable, comprehensive management strategy requires more than one perspective to be considered. This controversy demonstrates the inability of current methods to identify, define, measure and compare different social concerns (ecological, economic and social values). A water management system must reflect effective water uses and show an interrelationship with other plans and values of society. Adequate criterion must be developed to evaluate benefits and cost, optimum size, and priorities of values with respect to those values. This hindsight evaluation suggests that the instrument for resolution of the conflict of values will be the political process. (See also W76-01347) (Salzman-North Carolina) W76-01350

RESEARCH ISSUES IN WATER QUALITY MANAGEMENT, British Columbia Univ., Vancouver. Westwater

Research Centre For primary bibliographic entry see Field 5G. W76-01351

DECISION TO CONTROL EUTROPHICATION. Canada Centre for Inland Waters. Burlington (Ontario). For primary bibliographic entry see Field 5G. W76-01352

USER RESPONSE TO WATER QUALITY AND WATER-BASED RECREATION IN THE WATER-BASED RECREATION IN QU'APPELLE VALLEY, SASKATCHEWAN, Department of the Environment, Otto (Ontario), Inland Waters Directorate. Ottawa For primary bibliographic entry see Field 5G. W76-01353

NEW STRATEGIES FOR WATER RESOURCE PLANNING AND MANAGEMENT. Johns Hopkins Univ., Baltimore, Md For primary bibliographic entry see Field 4A. W76-01354

THE POTENTIAL IMPACT OF PEAK LOAD PRICING ON URBAN WATER DEMANDS: VICTORIA, BRITISH COLUMBIA, A CASE STUDY, Victoria Univ. (British Columbia). For primary bibliographic entry see Field 6D. W76-01355

WATER MANAGEMENT AND PRICING POLI-CIES IN ENGLAND AND WALES, London School of Economics and Political

Science (England).

In: Priorities in Water Management, Western Geo-graphical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, University of Victoria, Victoria, British Columbia, p 163-194, 4 fig, 3 tab, 37 ref. 1974.

Descriptors: *Pricing, *Water supply, *Legislation, *Marginal costs, Water distribution(Applied), River basin development, Water rates, Reservoirs.
Identifiers: *United Kingdom, Malvern(UK), Me-

tering of water use, Regional Water Authority, 1945 Water Act(UK), 1963 Water Resources Act(UK).

In the United Kingdom, lack of control over independent abstractions of water resulted in aquifer exhaustion and overpollution and inefficient development of new storage capacity. Three responses have occurred: (1) larger engineering schemes, with storage capacity, transport and cleaning facilities being developed to meet all foreseeable peak requirements in all areas; (2) changes in management structure of the water industry with reduction of the number of supply un-dertakings and introduction of a system of coordinated water management at the river basin level; and (3) steady removal of common law water rights to use stream courses and aquifers. Right to dispose of effluent has been curtailed and rights to obstruct water have been limited. Improved pricing techniques are provided in the 1974 Water Bill which transfers responsibility for revenue raising from local water and sewerage authorities to ten Regional Water Authorities. All water uses are to financed directly from charges made for services given and permits metering of all types of water use and charging on a quantity- taken basis. This could allow for metering domestic consumers and establishment of effluent charges, two measures hitherto strongly resisted. Under optimal pricing arrangements, the consumer pays the long run marginal costs which allows water to be allocated efficiently between competing uses. Using data obtained from Malyern, England, which has successfully enforced water metering to control demand, a forecast is made that metering can cause a decrease of over 20% in water demand. The merits of introducing metering in England and Wales are discussed with special attention given to cost of metering new property. Disposal of effluent is now subject to control on the quality, quantity, and timing of discharge. (See also W76-01347) (Salzman-North Carolina) W76-01356

THE ROLE OF THE PUBLIC IN DECISION-MAKING,

Wisconsin Univ., Madison.

E. L. David.

In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 203-215, 14 ref. 1974.

*Decision making, *Attitudes, *Coordination, *Institutions, Social Descriptors: *Planning, rhanning, Coordination, Institutions, Social aspects, Non-structural alternatives, Survey, Sin, Identifiers: *Susquehanna River Basin, *Brandywine River Basin, *Wisconsin River Basin, *Public participation, Gaming simulation.

If those who are affected by decisions are not involved in the decision-making process, inefficient and inequitable decisions will result. Problems of perceptions and interaction, composition of the relevant i and relationships between the public and institutions involved in water management are discussed. Although there are constraints on the use of survey research as a tool for public par-ticipation it can be used to inform decision-makers of public opinions and attitudes, to determine amount of information the public has on a particu-lar topic, and to isolate opinions, goals and perceptions of sub-groups. Public hearings, a very limited tool, generally Poorly and selectively attended, tend toward an adverse mechanism between an under- informed, ill-organized public and a wellorganized bureaucracy. Gaming simulation can expose the need for cooperation. There seems to be a broad potential for the gaming simulation technique which is only beginning to be explored. The challenge is to design institutions which will coalesce interested subgroups and bring their interest to bear throughout the decision-making process while insuring that the broadest feasible range of well-informed interests is represented. W76-01347) (Hufschmidt-North (See also Carolina) W76-01357

MANAGEMENT OF THE INTERNATIONAL GREAT LAKES, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 6E. W76-01358

Field 6-WATER RESOURCES PLANNING

Group 6B-Evaluation Process

THE ROLE OF THE ACADEMIC IN WATER RESOURCES POLICY-MAKING: THE TIJUANA RIVER, A CASE STUDY, California State Univ., San Diego.

E Keen

In: Priorities in Water Management, Western Geographic Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 241-255, 9 ref. 1974.

Descriptors: "Water supply development, "Cost-benefit analysis, "Social aspects, "Planning, "Political aspects, "Environmental effects, "Flood control, Water resources development, Ecology, Mexico, United States, Decision-making, Flood

plains, Data. Identifiers: *Tijuana River(Calif-Mexico), Tijuana River Flood Control Project, Academic community, Public participation.

Proposed for the Tijuana River Basin, an area of sparse vegetation situated in both Mexico and the United States, the Tijuana River Flood Control Project would control a high, but infrequent, runoff (3800 cubic meters/sec runoff occurring once in over 300 years) presently controlled by 3 large storage dams which would not contain a 100-year flood. Initially endorsed by the Army Corps of Engineers the project was suspended by Congressional inaction and probably will be killed by local governments after increasing public opposition underlined the increasing environmental and social costs, as well as capital costs to be incurred by the communities, that were not considered in the Corps benefit-cost analysis. The author, a geographer who organized the opposition forces and distributed information extensively researched, discovered manipulation of data by the Corps to alter the benefit-cost analysis and concluded that the project completion decision was political, not economic. Results of a study by local citizens, including faculty, indicated the project was wasteful of environmental as well as fiscal resources; damage to a salt marsh and farmland coupled with the high costs provided the arguments against the project. Subsequently, the public selected ecologically concerned government leaders in the next election who stopped the project. Realizing the leadership and testimony provided by academic personnel added to the effectiveness of the opposition, it is suggested that faculty members be obliged to contribute 20% of the academic responsibilities to service to the community as researchers, political decision-makers, interest group leaders and teachers of community par-ticipation. (See also W76-01347) (Salzman-North Carolina)

WATER RESOURCES PLANNING AND POL-ICY-MAKING: CHALLENGES AND RESPON-SES,

Univ. Victoria. (British Columbia).

W. R. D. Sewell.

W76-01359

In: Priorities in Water Management, Western Geographic Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 259-286, 2 fig, 57 ref. 1974.

Descriptors: *Planning, *Potential water supply, *Research and development, *Water allocation(Policy), *Water policy, *Attitudes, *Decision making, Institutions, Non-structural alternatives, Social values, Social participation. Identifiers: Public participation.

Contemporary water resources management faces 3 challenges: problem complexity and severity. competition for investment, and shifts in social values. These challenges imply a need for a broadened perspective in water management which accounts for economic, social, and ecological consequences and which examines alternative ways of dealing with a problem. Water shortages coupled with decline in quality has caused over-extraction of 'pure' sources and increasing de-mand between competitive users. As supplies

decrease, increased investment in water projects decrease, increased investment in water projects is expected to provide greater economic and social benefits. Skepticism concerning the adverse impacts of major water development projects as well as demand to participate in the decision-making process reflects the public's change in attitudes. Conventional means (the public hearing, the ballot box or referenda) of assessing public views do not seem to indicate public wants or reactions to proposed plans. The planning and policy-making model outlined described its processes as a series of sequential steps, identifying the goals or policy, specifying the problem, listing potential strategies, evaluating these, selecting a strategy and then implementing it. The processes include feedback loops to allow hindsight review of performances. To eradicate the weaknesses in water resource management such as identification of goals, range of alternatives and policy review requires in-creased public involvement in the planning process as well as adoption of economic princi-ples. Research is needed to develop techniques to evaluate a wide range of strategies and improve mechanisms to increase citizen participation. (See also W76-01347) (Salzman-North Carolina)

URBAN WATER DEMAND: AN ECONOMIC

EVALUATION, Sydney Univ., (Australia). School of Economics. For primary bibliographic en⁴-y see Field 6D. W76-01423

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

TECHNICAL AND ECONOMIC OPTIMIZA-TION OF REGIONAL WASTEWATER MANAGEMENT (TECHNISCHE UND WIRTSCHAFTLICHE OPERIMIERUNG BEI DER BILDUNG VON ZWECKVERBAENDEN ZUR ABWASSERBESEITIGUNG), For primary bibliographic entry see Field 5G. W76-01277

BENEFIT-COST ANALYSIS AND MULTIPLE-PURPOSE RESERVOIRS: A REASSESSMENT OF THE CONSERVATION AUTHORITIES' BRANCH DEER CREEK PROJECT, ONTARIO, University of Western Ontario, London For primary bibliographic entry see Field 6B. W76-01349

NEW STRATEGIES FOR WATER RESOURCE PLANNING AND MANAGEMENT, Johns Hopkins Univ., Baltimore, Md For primary bibliographic entry see Field 4A. W76-01354

THE HIGH COST OF RUNOFF CONTROLS: IS HELP NEEDED.
For primary bibliographic entry see Field 5D.

W76-01378

PRICE-INVESTMENT POLICIES OF URBAN

WATER AUTHORITIES, New South Wales Univ., Kensington (Australia). School of Economics.

D. R. Gallagher. In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 136-139, May 1975. 21 ref.

Descriptors: *Water rates, *Pricing, *Water allo-cation(Policy), *Water demand, Water supply, Ci-ties, Investment, Economic efficiency, Water

Price policy secures a link between investment in water supply facilities and the allocation and use of water supplied. The existing water rates policy

tends to encourage water use and needlessly large water supply systems. An alternative price policy is discussed. The peak-load price policy allows a more effective control of water demand and supply expansion. Demand control technology is needed in the urban water supply industry. (CSIRO) W76-01422

STUDY OF THE RELATIONSHIP BETWEEN EFFICACY OF PURIFICATION AND CONSTRUCTION AND OPERATING COSTS OF PU-RIFICATION PLANTS (UNTERSUCHUNG UEBER DIE BEZIEHUNG ZWISCHEN RENIN-GUNGSGRAD UND BAU UND BETR SKOSTEN VON KALERANLAGEN), For primary bibliographic entry see Field 5D. W76-01448 UND BETRIEB-

6D. Water Demand

WATER RESOURCES ASPECTS OF THE PROPOSED PERKINS STATION NUCLEAR POWER PLANT.

POWER PLANT.

North Carolina Dept. of Natural and Economic Resources, Raleigh. Water Resources Planning

For primary bibliographic entry see Field 8A. W76-01274

FACTORS AFFECTING ADOPTION OF LAND MUNICIPAL TREATMENT OF WASTE WATER.

North Carolina State Univ. at Raleigh. Dept. of Economics and Business.
For primary bibliographic entry see Field 5D. W76-01329

THE POTENTIAL IMPACT OF PEAK LOAD PRICING ON URBAN WATER DEMANDS: VICTORIA, BRITISH COLUMBIA, A CASE STUDY, Victoria Univ. (British Columbia).

W. R. D. Sewell, and L. Roueche. In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 141-161, 2 fig, 7 tab, 14 ref. 1974.

Descriptors: *Water demand, *Water management(Applied), *Pricing, *Elasticity of demand, Non-structural alternatives, Cost allocation, Marginal costs, Water supply, Canada.
Identifiers: *Peak load pricing, *Victoria(British
Columbia), *Seasonal pricing, David Hanke
model, Sewell-Roueche model, Price elasticities.

The emerging crisis in urban water management stems from the problem of satisfying demands. A critique on urban water pricing policies suggests that present prices based on average costs cause water outputs which exceed supply capacity and result in waste. Ideally, pricing policies should be based on marginal costs, and the price of water supplied in peak periods should carry the full cost upplying it. Tod determine prices, the elasticity of demand must be estimated. After citing several studies undertaken to estimate demand of water, this paper tests their conclusions against a case study in Victoria, British Columbia, in hopes of refining the theory relating to demand analysis. The Victoria water supply system was assessed on variables of consumption, price income, average summer temperatures and average summer rainfall. These data served as aids in computing a demand function which indicated that temperature and rainfall were significant variables and that price had no effect on summer demand. Study results show that demand is moderately inelastic although, surprisingly, peak period elasticities are lower than off-peak elasticities. Seasonal pricing would stimulate reduction in peak demands and encourage increase in off-peak demands resulting in a more continuous use of a larger proportion of

Water Law and Institutions-Group 6E

the facilities. (See also W76-01347) (Salzman-North Carolina) W76-01355

WATER MANAGEMENT AND PRICING POLICIES IN ENGLAND AND WALES, London School of Economics and Political Science (England). For primary bibliographic entry see Field 6B. W76-01356

PRICE-INVESTMENT POLICIES OF URBAN

WATER AUTHORITIES, New South Wales Univ., Kensington (Australia). School of Economics.

For primary bibliographic entry see Field 6C. W76-01422

URBAN WATER DEMAND: AN ECONOMIC

EVALUATION, Sydney Univ., (Australia). School of Economics. R. W. Robinson.

In: Hydrology Symposium, Armidale Australia 1975. The Institution of Engineers Australia, Preprints of Papers, p 140-143, May 1975. 1 fig, 17

Descriptors: *Water demand, *Economic predictions, *Water rates, *Elasticity of demand, *Australia, Water users, Water utilization, Forecasting, Projections, Pricing, Urban areas.

Forecasting long run water requirements generally assumes that consumer tastes, technology, price of commodity, prices of other goods and income are stable over time. Evidence is presented, in the course of a critique of the Australian water rate system, which demonstrates the positive value and dynamic nature of the determinants of water demand. Results of a residential water demand pilot survey are presented and discussed. (CSIRO) W76-01423

TRADEOFFS BETWEEN IRRIGATION SYSTEMS WITH DIFFERENT RELIABILITIES

OF SUPPLY, New South Wales Univ., Kensington (Australia). School of Economics.

For primary bibliographic entry see Field 3F. W76-01424

6E. Water Law and Institutions

WATER RIGHTS AND WATER QUALITY

MANAGEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center. For primary bibliographic entry see Field 5G. W76-01001

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FEDERAL-STATE RELATIONS IN WATER

QUALITY PLANNING, Pennsylvania Dept. of Environmental Resources, Harrisburg.

For primary bibliographic entry see Field 5G. W76-01003

THE ROLE OF THE WISCONSIN DEPARTMENT OF AGRICULTURE IN AGRICULTURAL POLLUTION PREVENTION AND CON-

Wisconsin Dept. of Agricultural, Madison For primary bibliographic entry see Field 5E.

FARM POLLUTION: HOW REGULATIONS AF-

Successful Farming, Vol 72, No 8, p 30, June-July, 1974.

Descriptors: *Permits, *Regulation, *Livestock, *Farm wastes, Waste storage, Waste disposal, Cost sharing, Legal aspects, Feed lots, Cost sharing. Identifiers: *Laws, Farm pollution, Stock yards.

Several states now administer Federal discharge permits. Only one permit is needed which covers both state and Federal regulations. But in most states, you need two permits—both state and Federal. All livestock facilities, which have a waste discharge and which hold for 30 days the following number of animals, must apply for a permit: slaughter and Feeder cattle-1,000; mature dairy cattle-700; all swine over 55 lbs-2,500. Livestock confinement facilities include open feedlots, confined feeding operations, stockyards, livestock auction barns and buying stations. Nonpoint source regulations are gaining consideration. Information and instructions on how to apply for permits and where to get cost-sharing help is given. (Cameron-East Central Oklahoma State) W76-01022

FEEDLOT POLLUTION.

Montana State Dept. of Health, Heiena. Water Pollution Control Section. For primary bibliographic entry see Field 5E. W76-01027

LIQUID MANURE MANAGEMENT FOR

Texas Agricultural Extension Service, College Station.

For primary bibliographic entry see Field 5E. W76-01030

IMPACT OF NITRATE FERTILIZER RESTRIC-TIONS ON SALT RIVER PROJECT AND ROOSEVELT WATER CONSERVATION DIS-TRICT GROWERS,

Arizona Univ., Tucson. Dept. of Agricultural Economics. For primary bibliographic entry see Field 5C.

SALINITY POLICY FOR COLORADO RIVER

Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 5G. W76-01126

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BAUXITE REFINING SUBCATEGARY OF THE ALUMINUM SEGMENT OF THE NON-FERROUS METALS MANUFACTURING POINT

SOURCE CATEGORY, Environmental Protection Agency, Washington D.C. Effluent Guidelines Div.

For primary bibliographic entry see Field 5G. W76-01201

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TIRE AND SYNTHETIC SEGMENT OF THE RUBBER PROCESSING POINT SOURCE

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

For primary bibliographic entry see Field 5G. W76-01202

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SOAP AND DETERGENT MANUFACTUR-ING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

For primary bibliographic entry see Field 5G. W76-01203

DEVELOPMENT DOCUMENT FOR EFFLUENT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE FOR NEW SOURCES. BEET SUGAR PROCESSING SUBCATEGORY OF THE SUGAR PROCESSING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington,

D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G.

W76-01204

DEVELOPMENT DOCUMENT FOR EFFLUENT DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE MAJOR INORGANIC PRODUCTS SEG MENT OF THE INORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGO-

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5D.

W76-01205

W76-01207

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE RED MEAT PROCESSING SEGMENTS OF THE MEAT PRODUCTS AND RENDERING PROCESSING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5D. W76-01206

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE MILLS POINT SOURCE

Enivronmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5D.

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NI SOURCE PERFORMANCE STANDARDS FEEDLOTS POINT SOURCE CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-01208

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SYNTHETIC RESINS SEGMENT OF THE PLASTICS AND SYNTHETIC MATERIALS MANUFACTURING POINT SOURCE CATEGO-

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G. W76-01209

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SMELTING AND SLAG PROCESSING SEGMENTS OF THE FERROALLOY MANU-FACTURING POINT SOURCE CATEGORY. Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G. W76-01210

Field 6-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE DAIRY PRODUCT PROCESSING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington,

D.C. Effluent Guidelines Div.

For primary bibliographic entry see Field 5G. W76-01211

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE UNBLEACHED KRAFT AND SEMICHEMICAL PULP SEGMENT OF THE PULP, PAPER, AND PAPERBOARD MILLS POINT SOURCE CATEGORY,

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

For primary bibliographic entry see Field 5G. W76-01212

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BASIC FERTILIZERS CHEMICALS SEG-MENT OF THE FERTILIZER MANUFACTUR-ING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington,

D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G.

W76-01213

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE STEEL MAKING SEGMENT OF THE IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington,

D.C. Effluent Guelines Div.

For primary bibliographic entry see Field 5G.

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE INSULATION FIBERGLASS MANUFACTURING SEGMENT OF THE GLASS MANUFACTURING POINT SOURCE CATEGORY, Environmental Protection Agency, Washington,

D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G.

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE APPLE, CITRUS, AND POTATO PROCESSING SEGMENT OF THE CANNED AND PRESERVED FRUITS AND VEGETABLES POINT SOURCE CATEGORY,

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G.

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BUILDING, CONSTRUCTION, AND PAPER SEGMENT OF THE ASBESTOS MANU-FACTURING POINT SOURCE CATEGORY, Environemental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G.

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR

W76-01217

THE SECONDARY ALUMINUM SMELTING SUBCATEGORY OF THE ALUMINUM SEGMENT OF THE NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGO-

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.

For primary bibliographic entry see Field 5G. W76-01231

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS
OF PERFORMANCE FOR THE CATFISH,
CRAB, SHRIMP AND TUNA SEGMENTS OF
THE CANNED AND PRESERVED SEAFOOD
PROCESSING INDUSTRY POINT SOURCE

Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div. For primary bibliographic entry see Field 5G. W76-01237

W76-01347

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE PETROLEUM REFINING POINT SOURCE

CATEGORY, Environmental Protection Agency, Washington, D.C. Effluent Guideines Div.

For primary bibliographic entry see Field 5G. W76-01238

CITIZEN INFLUENCE IN WATER POLICY DECISIONS: CONTEXT, CONSTRAINTS, AND

Washington State Univ., Pullman. Dept. of Political Science. For primary bibliographic entry see Field 6B. W76-01332

PRIORITIES IN WATER MANAGEMENT. Victoria Univ. (British Columbia). Dept. of Geog-For primary bibliographic entry see Field 6B.

VALUE CONFLICTS AND WATER SUPPLY DECISIONS,

Waterloo Univ. (Ontario) For primary bibliographic entry see Field 6B.

RESEARCH ISSUES IN WATER QUALITY

MANAGEMENT, British Columbia Univ., Vancouver, Westwater Research Centre.
For primary bibliographic entry see Field 5G.
W76-01351

USER RESPONSE TO WATER QUALITY AND WATER-BASED RECREATION IN THE QU'APPELLE VALLEY, SASKATCHEWAN, Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5G.

MANAGEMENT OF THE INTERNATIONAL

GREAT LAKES, Cornell Univ., Ithaca, N.Y.

L. B. Dworsky. L. B. DWOTSKY.
In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 217-239, 9 ref. 1974.

Descriptors: *International Joint Commission, *Management, *Planning, *Comprehensive planning, *Regional development, Non-structural alternatives, Administration, Institutions, Water management(Applied), Government, *Great Lakes. Identifiers: Boundary Water Treaty.

Following the Boundary Water Treaty (1909), the International Joint Commission (IJC) was formed by Canada and the United States to manage the rivers and lakes sharing the common boundary by constructing dams and hydroelectric power facilities, controlling water pollution and floods, exchanging lands affected by changed water courexchanging lands affected by changed water country. see and undertaking other tasks assigned by either country. The institutional structural inadequacies of the IJC in meeting these obligations became the focus of a Canada-U.S. University Seminar attempting to develop an alternative management plan which could effectively meet current problems such as deterioration of water quality, diffused public interest, apathy, skewed national priorities, inadequate legislation, special interest priorities, macquate registation, special meter-politics, fragmentation of responsibilities, and or-ganizational jealousies. To resolve these conflicts, the seminar, comprised of academies, students and government officials, proposed two alternatives: (1) organizational improvements to remove constraint of allowing IJC to act only on referred constraint of anowing the date of the constraint of anowing the matter and permit a more active role in public decision-making process, and (2) establishment of a joint management agency with a joint budget and administrative procedures, initiatory authority for planning, surveys, and research to develop a com-prehensive and integrated approach to management using joint information collection and analysis, and public reporting. The study process pro-vided large opportunities for small group dialogue which emphasized independence, credibility, fairness and objectivity. (See also W76-01347) (Salzman-North Carolina)

THE ROLE OF THE ACADEMIC IN WATER RESOURCES POLICY-MAKIN TIJUANA RIVER, A CASE STUDY, POLICY-MAKING: California State Univ., San Diego.

For primary bibliographic entry see Field 6B. W76-01359

WATER POLLUTION LAWS AND REGULA-

Missouri Univ., Columbia. Dept. of Agricultural Ecnomics. For primary bibliographic entry see Field 5G. W76-01375

EPA AND THE LIVESTOCK FEEDER. National Livestock Feeders Association, Omaha, For primary bibliographic entry see Field 5G. W76-01388

IMPACT OF ENVIRONMENTAL REGULATION ON THE LIVESTOCK INDUSTRY

National Livestock Feeders Association, Omaha,

For primary bibliographic entry see Field 5G. W76-01389

PACEM RECOMMENDATIONS BY MARIBUS V TO THE U. N. CONFERENCE ON THE LAW OF THE SEA.

Center for the Study of Democratic Institutions, Santa Barbara, Calif. E. M. Borgese.

Environmental Conservation, Vol 2, No 1, p 14-16, Spring, 1975.

Descriptors: *International law, *United Nations, *Law of the sea, International waters, Foreign countries, Exploitation, Mining, Regulation, Governments treaties, Political constraints, Manganese, Boundary disputes, Jurisdiction, Legal aspects, Administration, Minerology, Fishing mili-tary aspects, International commissions, Beds.

Identifiers: *Pacem in Maribus, *United Nations Conference on the Law of the Sea(UCLOS), Disarmament, Living resources, Water column.

The Fifth Pacem in Maribus Convention held in September 1974, once again emphasized that an ocean regime must encompass the oceans as a whole and be considered as a sub-system of the entire global system. Four main areas of concern emerged: (1) the need for a more precise definition of the limits of national jurisdiction; (2) problems of management of national and international ocean space; (3) the need to take full cognizance of scientific advances in framing the Law of the Sea' and (4) conflicts and gaps in areas covered by the working committees. Control of fishing and other working committees. Control of Itshing and other living resources, disarmanent and arms control in the oceans, and international regulations as to the use of ocean space were other areas of concern. The main contention of Pacem in Maribus is that activities on the sea-bed cannot be dissociated from activities in the water-column, at the surface, and at the atmospheric level. There must be an integrated management system for ocean space. (parrish-Florida) W76-01391

INFORMER FEES UNDER THE REFUSE ACT: DECIDING WHO GETS WHAT,

W. P. Buren. Environmental Law, Vol 5, No 2, p 321-329, 1975,

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Descriptors: *Rivers and Harbors Act, *Navigable Descriptors: "Rivers and Harbors Act, "Navigable water, "Pollution abatement, Wastes, Environmental effects, United States, Water quality, Adoption of practices, Judicial decisions, Water pollution control, Pollution taxes(Charges), Legislation, Costs, Water pollution, Water pollution sources, Legal aspects, Law enforcement, Water quality control. Identifiers: "Informer's fees, "Fines, "Refuse Act of 1890

Under the Rivers and Harbors Act of 1899, one half of the fine levied against an offender for discharging unauthorized refuse into the navigable waters of the United States is awarded to anyone giving information leading to the conviction of the defendant. In multi-count actions against modern industrial polluters, however, there arises the possibility of frequent unearned windfalls to parties providing relatively little evidence to the prosecuoffered courts in determining informers' fees under the act, that is, the power to decide if the informer 'qualified' as a provider of original information. A 1972 decision, United States v Anaconda Wire and Cable Co., appears to give courts wide discretionary powers in determining the amount of the award as well. A claimant under Anaconda no longer must show he was the first informer; instead, the court may look to the 'totality of the circumstances' to determine an appropriate reward. Further modification and clarification of the Refuse Act in this area is likely. (Parrish-Florida) W76-01392

WATER AS A TOOL IN LAND USE CONTROL, LEGAL CONSIDERATIONS: AN EXPLORATO-

RY ESSAY, White and Burke, Fort Collins, Colo.

M. D. White.

Rocky Mountain Mineral Law Institute Annual, Vol 20, p 671-690, 1975. 60 ref.

Descriptors: *Regulation, *Planning, *Land use, *Land resources, *Water policy, Water resources, Watershed management, Local governments, Zoning, Permits, Judicial decisions, Legal aspects, Political aspects, Land, Land development, Land management, Water management(Applied), Water permits, Water law. Identifiers: State policy, Water rights(Non-riparians), Nuisance(Legal aspects).

The issue to whether water resource planning or land resource planning should predominate in land use control has received little attention. Water supply can be controlled at the point of effluent discharge, at the water tap, and at the source of supply. Unrealistic water quality restrictions create a hardship on irrigation practices when control is exercised at the source of discharge. Efforts to alleviate pressure on inadequate municipal water and sewage treatment facilities by time-phased zoning have drawn mixed judicial attention. Municipal regulation of watersheds often clashes with broader-based efforts. Condemnation clashes with broader-based efforts. Condemnation of water rights may facilitate land use goals if money is available to compensate those whose water interests are condemned. Police power regulation which does not require compensation can be exercised through public nuisance legislation, zon-ing, and transferable development rights. The legal and institutional effects of policy decisions regarding water and land use controls need further exploration. (Jenkins-Florida)

DEPARTMENT OF ENVIRONMENTAL PROTECTION V JERSEY CENTRAL POWER AND LIGHT CO. (DAMAGES FOR FISH KILL FROM DISCHARGE OF COLD WATER INOT NOR-MALLY WARMED WATER), 5 ELR 20370-20373 (Super Ct. NJ App. Div.,

Descriptors: *Thermal pollution, *New Jersey, *Judicial decisions, *Industrial wastes, *Radioactive wastes, Cooling water, Industrial plants, Industrial water, Waste water treatment, Aquatic life, Ecology.
Identifiers: Atomic Energy Commission, Nuclear

After its nuclear generating plant was temporarily shutdown, the defendant continued to discharge shutdown, the defendant continued to discharge cold rather than warm water from its pumps. Because of this cold discharge into the normally warmed waters of the creek, a large fish kill oc-curred. Defendant was convicted for a statutory violation for introducing a hazardous or destruc-tive substance into state waters. In addition to statutory penalties, the state was allowed to receive under the deciring of paragraphics comreceive, under the doctrine of parens patriae, com-pensatory damages for the fish kill. On appeal the defendant argued that the statute was unconstitutionally vague in that it did not specifically men-tion thermal pollution. The defendant also argued that the temporary shutdown that resulted in cold, rather than warm water being discharged, was necessitated by an Atomic Energy Commission (AEC) requirement that the reactor be shut down when the leakage of reactive coolant reached a certain level. The court rejected both arguments, and as to the second, found that the cold water pumping was not the result of the AEC directive, but was done to facilitate resumption of the generator operation after repairs had been completed. The continued discharge was held negligent under the circumstances, and the defendant was properly liable for compensatory damages. (Hoffman-Florida)

REGULATION OF GREAT LAKES WATER LEVELS, A SUMMARY REPORT, 1974. International Joint Commission-United States and Canada. Great Lakes Levels Board.

For primary bibliographic entry see Field 4A. W76-01395

WATER 'MINING' DECLARED UNLAWFUL UNDER IDAHO GROUND WATER STATUTE. Rocky Mountain Mineral Law Newsletter, Vol 7, No 2, p 1-2, February 1974.

Descriptors: *Water policy, *Idaho, *Hydraulic mining water, *Judicial decisions, Legal aspects, Legislation, Exploitation, Water loss, Water con-

sumption, Water management(Applied), Water al-location(Policy), Water control, Water utilization, Water resources, Water resources development,

Identifiers: *Injunctive relief.

In a full-scale review of Idaho underground water law, the Idaho Supreme Court determined that the provisions of the Idaho Ground Water Act forbid mining of an aquifer. Senior groundwater ap-propriators brought an action to enjoin junior ap-propriators who were pumping from their common aquifer. The trial court, on the basis of conflicting testimony of three hydrology experts, found cer-tain priorities of development of the appropriawells. It determined that an injunction should issue to stop mining of the aquifer at rates greater than the annual recharge rate. On appeal to the Idaho Supreme Court appellants asserted that they were entitled to a pro-rata share of the water under the correlative rights doctrine and that the Ground Water Act only protected senior appropriators from unreasonable pumping levels by the juniors. The Court found that Idaho had expressly rejected that theory in 1931 and that the statutory scheme of the Idaho Ground Water Act had not reintroduced the doctrine. The Court concluded that the lower court's findings were supported by sub-stantial evidence and affirmed. (Proctor-Florida) W76-01396

ALASKA SUPREME COURT REJECTS BROAD STATE NAVIGATIONAL SERVITUDE NO-COMPENSATION RULE.

Rocky Mountain Mineral Law Newsletter, Vol 7, No 2, p 1-2, February 1974.

Descriptors: *Condemnation, *Eminent domain, *Judicial decisions, *Navigable waters, *Legal aspects, *Alaska, Cost repayment, Economics, Economic impact, Government, Water resources development, Water law, Bodies of water, Riparian rights, Riparian waters.
Identifiers: *Inverse condemnation, *Navigational

For 20 years, plaintiff had used a creek and the tides for access from his property to the deep waters of Cook Inlet for his commercial fishing boats. The State of Alaska constructed a federal aid highway across the creek and tideland blocking the high-tide water flow up the creek and destroyed the creek's navigability, as well as plaintiff's access to Cook inlet. Plaintiff sued for inverse condemnation. The lower court dismissed the complaint for failure to state a valid claim for relief because the state's action was a non-compensable taking pursuant to the state navigational servitude. The Court reviewed three general variations of the doctrine of navigational servitude. The general rule provides for compensation for taking unless the project is in aid of navigation. The public purpose variation prohibits compensation if the project is for any public purpose. The Louisiana exception is applicable solely to that state. The court adopted a restricted version of the general rule allowing compensation if property is taken for a non-navigable purpose. (Proctor-W76-01397

OPTIMAL ENVIRONMENTAL JURISDIC-TIONS. Roosevelt Univ., Chicago, Ill.

R. O. Zerbe. Ecology Law Quarterly, Vol 4, No 2, p 193-245, 1974. 3 tab, 22 ref.

Descriptors: *Federal jurisdiction, *Local governments, *Optimization, *State jurisdiction, *Political constraints, Water pollution control, Air pollution, Environmental control, Pollution abatement, Property values, Industries, Social aspects, Land use, Political aspects, Water rights, Governmental interrelations, Jurisdiction.

Field 6-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

Identifiers: Monopsony, Economic incentives, Administrative regulations, Environmental policy, Water rights(Non,riparian), Local jurisdiction, Water rights(Non,riparian), Local jurisdiction, Federal Water Pollution Control Amendments of 1972, Auto emission control, Optimal environmental jurisdictions.

Effective environmental controls depend partially on the control jurisdiction. The federal government's power over air and water resources greatly exceeds that of state and local government. The capacity for local pollution control has been underestimated. In determining the optimum jurisdictional arrangement, net social benefits rather than exclusively political values should be considered. Local incentives for pollution control may be present where pollution causes a decrease in property values and local revenue. Exclusionary zoning standards which are too severe may divide a community along income lines with the adverse effects of control felt by lower income groups. Competition among localities for new industry does not mitigate incentives for local environmental control but is a desire equilibrating process. Local environmental control will also benefit nonresidents through pricing signals. Another issue of control jurisdiction is that of undue uniformity of federal pollution standards. Such uniformity is often inefficient and inequitable. One example is motor vehicle pollution standards. A control ju-risdiction must be large enough to eliminate important interjurisdictional pollution and take ad-vantage of scale economics. Air and water pollu-tion control can be maximized by regional or local jurisdiction. Federal jurisdiction over research, however, remains desirable. (Jenkins-Florida) W76-01398

NATIONAL OIL AND HAZARDOUS SUB-STANCES POLLUTION CONTINGENCY PLAN. Council on Environmental Quality, Washington, D.C.

For primary bibliographic entry see Field 5G. W76-01399

A PRIMER ON THE BOUNDARY WATERS TREATY AND THE INTERNATIONAL JOINT COMMISSION,

P. Pantaleo. North Dakota Law Review, Vol 51, No 2, p 493-508, 1974, 145 ref.

Descriptors: *International Joint Commission, *Treaties, *International law, *Canada, *United States, *Salinity, Water quality, Water properties, Legal aspects, Foreign waters, International waters, Foreign countries, Jurisdiction, Water pollution, Water law, Path of pollutants, Water pollution effects, Water pollution control, Water pollution sources, Water quality control, Organization, Saline water intrusion.

Project, Identifiers: Garrison Diversion *Boundary Waters Treaty Nuisance(Legal aspects).

Discussed are possible legal avenues available to Canada through the Boundary Waters Treaty of 1909 and the International Joint Commission for problems caused by the Garrison Diversion Pro-ject which has increased the salt level of the Souris River. The appliability of the treaty to Canadian objections to Garrison Diversion is examined by outlining the history of the treaty and the reasons for its formulation. A detailed analysis is presented of the organization functions and procedures of the International Joint Commission established by the treaty. It is concluded that an individual Canadian injured by the Garrison Diver-sion Project would have no problem suing in an American court on a nuisance theory. Another al-ternative a Canadian might pursue would be securing the intervention of his government on his behalf. The Canadian government could secure the investigation of the alleged pollution by the Com-mission or attempt to secure the consent of the United States government to arbitration under which both countries would be bound by the arbitration decision. (Nursey-Florida) W76-01400

HAWAIIAN BEACH ACCESS: A CUSTOMARY RIGHT, M. D. Tom.

Hastings Law Journal, Vol 26, No 3, p 823-847, 1975, 172 ref.

Descriptors: *Hawaii, *Beaches, *Public access, *Easements, Water law, Legal aspects, Coasts, State governments, Legislation, Judicial decisions, Constitutional law, Common law, Public rights, Equity, Land tenure, Trespass, Seashores, History, Recreation.

Identifiers: *Customary right doctrine, Public trust doctrine, Hawaiian legal history, Estoppel,

Piscary rights.

Commercial development in Hawaii has signifi-cantly reduced public access to the state's beaches. To obtain an effective balance between the conflicting interests of the public and the upland owners, a customary right doctrine should be utilized to establish a public right of beach access, and a traditional abandonment concept should be applied to protect upland private proper-ty rights. Through the customary right doctrine, particular local custom can acquire the force of law. The development of the doctrine is traced and its applicability is considered in light of Hawaiian history, judicial decisions, and legislation. The requirements for application of the doctrine are discussed, both generally and within the context of Hawaiian law. Hawaiian decisions concerning piscary and water rights are examined, and the conclusion reached that the customary right of beach access was historically a public right which the sovereign could not convey. Recent cases con-cerning beach ownership are discussed, as are the constitutional issues relevant to the proposal presented. Where appropriate, the Hawaiian courts can protect the rights of upland owners by curtailing or modifying the access right through the doctrine of extinguishment. (Schilling-Florida) W76-01401

LAWMAKING FOR THE SEAS,

J. R. Stevenson. American Bar Association Journal, Vol 61, p 185-190, February 1975. 1 photo, 2 ref.

Descriptors: *United Nations, *International law, *Law of the sea, *Negotiations, Treaties, Legal aspects, Water rights, Boundary disputes, Governments, International waters, Navigation, Fishing, Resources, Organizations, Foreign countries, Foreign waters, Water law, Oceans. Identifiers: *Coastal waters, *United Nations Conference on the Law of the Sea.

The Third United Nations Conference on the Law of the Sea is discussed. The fundamental task of this conference is to agree on a local regime governing the activities of men and nations on the world's oceans. The law of the sea negotiations are described as an example of the international lawmaking process and those aspects of the process that appear to be most constructive in facilitating agreement on a constitution for the oceans are discussed. The spiral of competing and escalating claims to the use of the same ocean space and resources have made it necessary to have a system of international as opposed to national law for the world's oceans. The most viable solution to this lawmaking for the oceans is a comprehensive multilateral treaty. All areas of dispute should be resolved within one document rather than individual agreements which serve the special interests of particular nations. The international lawmaking procedures followed may also contribute to the ultimate success or failure of the conference. The following procedural aspects are discussed: (1) decision making; (2) the role of committees and working groups; and (3) the establishment of rule-making machinery and compulsory dispute settlement. (Nursey-Florida) W76-01402

LEGAL REMEDIES FOR POLLUTION ABATE-MENT.

Missouri Univ., Columbia. For primary bibliographic entry see Field 5G. W76-01403

CEMENT PRODUCERS CONFRONT ANTI-POLLUTION LEGISLATION.

G. L. Koonsman. Rock Products, Vol 74, p 161-162, 184, 186, October 1971. 1 photo.

Descriptors: *Concrete technology, *Rivers and Descriptors: *Concrete technology, *Rivers and Harbors Act, *Industrial wastes, Waste water(Pollution), Slurries, Water pollution sources, Navigable waters, Permit, Legislation, Law enforcement, Water requirements, Cooling water, Industrial water, Water supply, Water treatment, Waste water disposal, Environmental

The Rivers and Harbors Act of 1899 prohibits the discharge of refuse matter into any navigable water without a permit from the Secretary of the Army. One-half of the fine collected is paid to the person or persons whose information leads to a conviction under the Act. All cement plants use and discharge water. As pollutors, they will find more and more concern being given to the quality of water they discharge. Cement plants use water for such purposes as cooling, dust collection, dust leaching, cleaning and fire protection. If disposal of the soils is not handled carefully, it may be a violation of the Rivers and Harbors Act. In addition two hundred and fifty residents are filling out federal water quality questionnaires which seek various types of information. Industry has shown concern over the questionnaire on two points. Will the information be kept confidential, and will it be used for enforcement purposes. The questionnaire and the Rivers and Harbors Act combined may be the means used to force industry to divulge pertinent data in applying for a permit. (Sperling-W76-01404

MARTIN-TRIGONA V. RUCKELSHAUS (CHALLENGE OF EXECUTIVE IMPOUND-MENT OF FWPCA FUNDS). 1 Pollution Control Guide, Vol 3, paragraph 15023,

p 15211-15216, 1973.

Descriptors: *United States, *Government *Administrative finance, agencies, *Administrative decisions, Budgeting, Legal aspects, Administration, Treatment facilities, Construction, Jurisdiction, Decision Regulation, Coordination. Identifiers: *Impoundment, Standing(L Sovereign immunity, Justiciable controversy. Standing(Legal),

The federal district court ordered the Environmental Protection Agency Administrator to allot among the states all sums designated by Congress for sewage treatment works construction projects approved by the Administrator for federal funding. A private citizen has legal standing to compel the Administrator to expend these sums. Citizen suits are available to compel the Administrator to perform a nondiscretionary act or duty. The doctrine of sovereign immunity as a defense to the courts assertion of jurisdiction is inapplicable in a suit which challenges action by a federal officer that allegedly goes beyond the scope of that officer's statutory power. The sovereign immunity defense can only be asserted when the judgment may force an expenditure from the public treasury. The Administrator's refusal to make a full allotment of appropriated sums produces interests sufficiently adverse, and a legal issue of sufficient immediacy and reality to create a justiciable controversy. (Sperling-Florida)

W76-01405

ENVIRONMENTAL DEFENSE FUND, INC. V. CALLAWAY (SEEKING DECLARATION THAT FINAL ENVIRONMENTAL IMPACT STATE-MENT FOR DAM AND RESERVOIR WAS IN-ADEQUATE UNDER NEPA). 497 F.2d 1340 (8th Cir 1974).

Descriptors: "Missouri, "Federal jurisdiction, "Judicial decisions, "United States, "Legislation, Reservoir, Standards, Adoption of practices, Construction, Legal review, Law enforcement, Regulation, Governmental interrelations, Economic aspects, Decision making.

Identifiers: *National Environmental Policy Act.

*Environmental Impact Statements, Declaratory relief(Legal aspects), Injunctive relief(Legal

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This was an action arising out of the United States District Court for the Western District of Missouri seeking declaratory and injunctive relief against the Secretary of the Army. At issue is the suffi-ciency of the final environmental impact statement for the Army Corps of Engineers' Harry S. Tru-man Dam and Reservoir Project being built on the Osage River. The district court refused to grant in-junctive relief. On appeal the trial court's deter-mination that the environmental impact statement met the standards of the 1969 National Environmental Policy Act was affirmed. The court also affirmed the taxing of costs. The district court assessed the costs against each party up to the date of the first decision that an environmental impact statement was necessary for the project. (Sperling-Florida) W76-01406

AMERICAN PLANT FOOD CORP. V. STATE OF TEXAS (APPEAL FROM CRIMINAL CON-VICTION FOR POLLUTION OF WATERS). 508 S.W.2d 598 (Tex. App. 1974).

Descriptors: *Water pollution, *Water pollution sources, *Legislation, *Judicial decisions, Waste disposal, Effluents, Sewage, Industrial wastes, *Texas, Water law, Water resources development. Identifiers: Due process, US Constitution, Criminal sanctions.

The defendant corporation was convicted of water pollution under a Texas criminal statute, and appealed. Appellant alleged inter alia that the statute under which the conviction was obtained was unconstitutionally indefinite and vague. The court rejected that contention, as well as allegations of lack of due process, and statutory conflict and affirmed the trial court on all grounds. (Proctor-Florida) W76-01407

SATZGER V. CLERMONT COUNTY BOARD OF COMMISSIONERS (SUIT FOR DAMAGES FOR OVERFLOW OF WATER FROM WATER

TOWER). 318 N.E.2d 421 (Ohio App. 1974).

Descriptors: *Overflow, *Water storage, *Negligence, *Towers, *Damages, Municipal water, Judicial decisions, Legal aspects, Accidents, Risks, Seepage, Water loss, *Ohio. Identifiers: Sovereign immunity, Injunction.

Plaintiffs sought monetary and injunctive relief against the board of county commissioners for overflow of water from a water tower maintained by the county on adjoining property. The trial court granted injunctive relief, but denied moneta-ry damages. The Court of Appeals of Ohio affirmed, holding that in absence of a statute fixing liability, boards of county commissioners are immune from tort liability. (Denvir-Florida)

6F. Nonstructural Alternatives

NONSTRUCTURAL MEASURES FOR FLOOD PLAIN AND FLOOD DAMAGE MANAGE-MENT, WITH APPLICATION TO THE CON-NECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY,

Cheney, Miller, Ellis and Associates, Inc., Put-nam, Conn.

P. B. Cheney, D. A. Yanggen, P. M. Glick, and H. C. Miller.

C. Miller.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-238-498, \$7.75 in paper copy, \$2.25 in microfiche. Prepared for New England River Basins Commission, Boston, Mass. Working paper, February 28, 1974. 182 p, 17 fig, 11 tab, 34 ref. CRSS-NERBC 1.2-4E. NERBC 1.2-4E.

Descriptors: *Planning, *Non-structural alterna-Descriptors: "Planning, "Non-structural alterna-tives, "Connecticut River, "Flood plains, "River basin development, "Flood proofing, Manage-ment, "Land management, Flood control, Flood protection, Flood plain insurance, Water zoning, Building codes, Governments, Legislation, New Hampshire, Massachusetts, Connecticut.

Identifiers: *Flood plain management, New England River Basin Commission.

After identifying the present national flood plain situation and management tools within an institu-tional framework, Part I of this report details nonstructural techniques for flood management in the Connecticut River Basin and discusses their advantages and limitations along with the effectiveness of existing and proposed programs for nonstructural management at the state level in the basin. A flood plain management system depends upon the area's physical characteristics as well as the weight given to social and environmental objectives. Alternatives to structural works such as flood proofing, urban redevelopment, permanent evacuation, and governmental regulatory mea-sures can control the amount and type of growth which will be subject to flood damage. Passage of national land use policy legislation will provoke the states to implement flood plain management programs. Part II contains the framework for applying information on non-structural measures to actual flood plain situations in the Basin and a discussion of selected examples of non-structural flood management at the community level. The study focuses upon the technical feasibility of the measures, their ability to meet the objectives of flood management and their implications from the standpoint of implementation costs. This framework for regulating flood plains will serve as an aid for developing comprehensive plans for the Connecticut River Basin (Salzman-North W76-01345

SPECIAL FLOOD HAZARD REPORT: CAMP-BELL CREEK, GREATER ANCHORAGE

Army Engineer District, Anchorage, Alaska. For primary bibliographic entry see Field 4A. W76-01361

PLAIN INFORMATION: CREEK, ORANGE COUNTY, CALIFORNIA. Army Engineer District, Los Angeles, Calif. For primary bibliographic entry see Field 4A. W76-01362

SPECIAL FLOOD HAZARD INFORMATION: BEAR AND EVANS CREEKS, REDMOND AND VICINITY, WASHINGTON. Army Engineer District, Seattle, Wash.

For primary bibliographic entry see Field 4A. W76-01363

FLOOD PLAIN INFORMATION: EIGHT MILE CREEK, VICINITY OF PARAGOULD, ARKAN-

Army Engineer District, Memphis, Tenn. For primary bibliographic entry see Field 4A. W76-01364

FLOOD PLAIN INFORMATION: PART I -BAYOU BARTHOLOMEW AND TRIBUTARIES, CITY OF PINE BLUFF, ARKANSAS. Army Engineer District, Vicksburg, Miss. For primary bibliographic entry see Field 4A. W76-01365

SPECIAL FLOOD HAZARD INFORMATION: WOLF LODGE CREEK AND TRIBUTARIES, VICINITY OF COUER D'ALENE, IDAHO. Army Engineer District, Seattle, Wash. For primary bibliographic entry see Field 4A. W76-01367

FLOOD PLAIN INFORMATION: POCOSHOCK AND POCOSHAM CREEKS, CITY OF RICHMOND AND CHESTERFIELD COUNTY.

Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W76-01368

FLOOD PLAIN INFORMATION: CASPER, WYOMING, VOLUME III, NORTH PLATTE RIVER.

Army Engineer District, Omaha, Nebr. For primary bibliographic entry see Field 4A. W76-01369

FLOOD PLAIN INFORMATION: ST. JOE AND ST. MARIES RIVERS, CITY OF ST. MARIES AND VICINITY, IDAHO. Army Engineer District, Seattle, Wash. For primary bibliographic entry see Field 4A. W76-01370

SPECIAL FLOOD HAZARD REPORT: TO REVISE FLOOD PLAIN INFORMATION, METROPOLITAN REGION, DENVER, COLORADO; VOLUME II: SAND, TOLL GATE AND LOWER CHERRY CREEKS, SOUTH PLATTE RIVER BASIN.
Army Engineer District, Omaho, Nebr.
For primary bibliographic entry see Field 4A.

W76-01371

FLOOD PLAIN INFORMATION: PROCTORS CREEK, CHESTERFIELD COUNTY, VIR-

Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W76-01372

FLOOD PLAIN INFORMATION: SAN LORENZO RIVER, BOULDER CREEK-FEL-TON, SANTA CRUZ COUNTY, CALIFORNIA. Army Engineer District, San Francisco, Calif. For primary bibliographic entry see Field 4A. W76-01373

FLOOD PLAIN INFORMATION: APTOS, TROUT AND VALENCIA CREEKS, CITY OF APTOS, CALIFORNIA. Army Engineer District, San Francisco, Calif. For primary bibliographic entry see Field 4A. W76-01374

WATER AS A TOOL IN LAND USE CONTROL, LEGAL CONSIDERATIONS: AN EXPLORATO-RY ESSAY,
White and Burke, Fort Collins, Colo.
For primary bibliographic entry see Field 6E.

Field 6-WATER RESOURCES PLANNING

Group 6F-Nonstructural Alternatives

W76-01393

STILLWATER RIVER AND ROSEBUD CREEK FLOOD HAZARD ANALYSES, STILLWATER COUNTY, MONTANA.

Soil Conservation Service, Bozeman, Mont. For primary bibliographic entry see Field 2E. W76-01483

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL IMPACT STATEMENTS IN PLANNING WATER AND RELATED LAND RESOURCES,

State Univ. of New York at Syracuse. Coll. of Environmental Sciences and Forestry.

Water Resources Bulletin, Vol 11, No 5, p 881-886, October 1975. 2 tab, 18 ref.

Descriptors: *Water resources development, *Planning, *Environment, Land resources, Evaluation, Ecology, Forecasting, Cost-benefit analysis, Cost-benefit ratio, Economics, Water

analysis, Custoneria land, Economics, policy, Risks.
Identifiers: *Environmental impact statement, Principles and standards (WRC), Resource use, NEPA, Uncertainty, Multiple objectives.

The history of water and related land resources planning suggests that environmental and economic considerations should be kept separate. Attempts to evaluate 'intangibles' in the benefit-cost analysis and to include economics in environmental evaluation cloud the issue. The benefit-cost analysis is represented by a simple ratio; efforts to balance it by a verbose statement of complex ecological description and environmental interactions does not clarify the problem. The uncertainties of ecological forecasting are no worse than those associated with economic forecasting. A properly constructed environmental impact state ment can be effective in planning resource use and can consequently lead naturally to the consideration of a broader range of governmental actions than is presently the case. The impact statement should not be an encyclopedia of the local ecology; rather, it should accurately represent the environment which the action will impact and thoroughly analyze only the potential impacts of the proposed action and its alternatives on that environment. The first step is to develop a 'tiered' approach to policy, programs, projects, and practices involving resources development, so that unnecessary duplication of analysis and reporting is eliminated, and so that each statement deals only with the action, environment, and impact at hand. Impacts may be classified according to portance, magnitude, and probability, etc. (Bell-Cornell) W76-01333

ENVIRONMENTAL. RECONNAISSANCE TECHNIQUES FOR CONNECTICUT RIVER BASIN WATERSHEDS,

Center for the Environment and Man. Inc., Hartford. Conn. For primary bibliographic entry see Field 4D. W76-01344

ENVIRONMENTAL HAZARDS OF LARGE SCALE WATER DEVELOPMENTS. Geological Survey, Raleigh, N.C. R. L. Nace.

In: Priorities in Water Management, Western Geographical Series, Vol 8, F. M. Leversedge, ed. University of Victoria, Victoria, British Columbia, p 3-18, 1974. 1 tab, 18 ref.

Descriptors: *Environmental effects, *Dams, *Post impoundment, *Earthquakes, *Impoundments, *Diversion, Environmental en-*Earthquakes, gineering, *Africa, Water pollution, Management, Water distribution, Water sources, Water control. Identifiers: River impoundments, Climate modification, North American Water and Power Al-liance(NAWAPA), African Sea, Earth wobble, Geostatic loading, Siberian River, Great South American Lakes

Consequences of water projects on the environment are rarely accounted for in the development and construction of the project. Several examples of unwanted and unforeseen effects such as en-vironmental destruction and disruption, epidemic spread of endemic disease, and economic, social and political disruption of human institutions are documented. River impoundments and diversions documented. River impoundments and diversions emphasize the possibilities of environmental degradation occurring due to lack of policy and planning. Water power proposals often ignore forces that could be set in motion in response to immutable natural laws. Besides modifying landscapes and upsetting local and regional ecology, more drastic effects such as climate changes, earth wobble, and earthquakes caused by geostatic loading imposed usually by large dams and less frequently by reservoirs can result. These environ-mental effects are caused by irrigation, power production and river impoundments for recreation and water supply. Documented areas affected in-clude the Northern American Water and Power Alliance (NAWAPA), the Siberian River Diver-Alliance (NAWAPA), the Storman Kiver Diversion, the Great South American Lakes project and the African Sea. Knowledge about natural processes is too limited to permit accurate foresight even of local and regional effects, let alone possible continental and global hazards. (See also W76-01347) (Salzman-North Carolina) W76-01348

OPTIMAL. ENVIRONMENTAL JURISDIC-

Roosevelt Univ., Chicago, Ill. For primary bibliographic entry see Field 6E. W76-01398

ENVIRONMENTAL DEFENSE FUND, INC. V. CALLAWAY (SEEKING DECLARATION THAT FINAL ENVIRONMENTAL IMPACT STATE-MENT FOR DAM AND RESERVOIR WAS IN-ADEQUATE UNDER NEPA). For primary bibliographic entry see Field 6E. W76-01406

SACRAMENTO RIVER BANK PROTECTION PROJECT, CALIFORNIA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Sacramento, Calif. For primary bibliographic entry see Field 8D.

W76-01409

ZUMBRO RIVER BASIN, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, St. Paul, Minn. For primary bibliographic entry see Field 8A. W76-01411

BAYOU BODCAU AND TRIBUTARIES, ARKANSAS AND LOUISIANA ASSOCIATED WATER FEATURES, RED RIVER, BAYOU BODCAU, FLAT RIVER, RED ETC...(FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, New Orleans, La For primary bibliographic entry see Field 8A. W76-01412

OCEAN OUTFALLS AND OTHER METHODS OF TREATED WASTE-WATER DISPOSAL IN SOUTHEAST FLORIDA, (ENVIRONMENTAL IMPACT STATEMENT). Environmental Protection Agency, Atlanta, Ga.

Region IV. For primary bibliographic entry see Field 5D. W76-01413 SAINT FRANCIS BASIN PROJECT, ARKANSAS AND MISSOURI, (ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 8A.

W76-01414

7. RESOURCES DATA

7A. Network Design

PROCEDURES FOR THE OPTIMUM USE OF GEOPHYSICAL METHODS IN GROUND-WATER DEVELOPMENT PROGRAMS, Pretoria (Sou. Africa). National Physical Research

For primary bibliographic entry see Field 2F. W76-01125

OPTIMIZING INFORMATION TRANSFER IN A STREAM-GAGING NETWORK.

STREAM-GAGING NET WORK,
Geological Survey, Reston, Va.
P. H. Carrigan, Jr., and H. G. Golden.
Available from National Information Service,
Springfield, Va 22161 as PB-245-190 as \$3.50 in
paper copy, and \$2.25 in microfiche. WaterResources Investigations 30-75, September 1975. 25 p, 8 fig, 7 tab, 9 ref.

Descriptors: *Stream gages, *Streamflow, *Network design, *United States, *Computer models, Data collections, Operations research, Streamflow forecasting, Gaging stations, Optimization, Correlation analysis, Streams, Illinois, Georgia Montana Georgia, Montana Identifiers: Mixed integer programming.

Networks of small stream (less than 50 sq mi) gages have been operated by the Geological Survey throughout the country for a number of years to supplement flood information for large streams. The goal in operation of these networks has been to obtain sufficient data for estimating flood frequency at ungaged sites with the equivalent accuracy expected from 10 years of observed flood records. Most networks have accumulated suffi-cient data to satisfy these accuracy requirements. A review is made of these data for possible reduction of the number of gages in the networks. Thomas Maddock in 1974 developed a rational method for selecting gages to be retained in a reduced hydrologic network. This method of net-work analysis will result in selecting the optimum set of gages retained for a given level of annual operating costs with the information content of the reduced network being the factor optimized. Mad-dock's method of analysis is described and its use described in detail for a hypothetical network in Illinois, Georgia, and Montana. (Woodard-USGS) W76-01187

METHODS AND DATA REQUIREMENTS FOR RIVER-QUALITY ASSESSMENT, Geological Survey, Portland, Oreg. For primary bibliographic entry see Field 5A. W76-01334

7B. Data Acquisition

REMOTE SENSING TECHNIQUES FOR EVALUATION OF SOIL WATER CONDITIONS, South Dakota State Univ., Brookings. Remote Sensing Inst.

F. A. Schmer, and H. D. Werner.
Transactions of the ASAE (American Society of Agricultural Engineers) Vol 17, No 2, p 310-314, March-April 1974. 6 fig, 3 tab, 8 ref.

Descriptors: *Remote sensing, *Soil moisture, *Grain sorghum, Films, Filters, Infrared radiation, Wavelength, Reflectance, Irrigation, Agriculture, Irrigation practices, Soil water, *Water analysis,

Identifiers: *Multispectral imagery, *Crop canopy, *Spectral bands.

The results of two years of soil water research indicate that remote sensing did provide a valuable tool in evaluation of soil water condition for the crop and soils studied. Multispectral data collection and analysis seem to hold the key to the development of the necessary remote sensing techniques for operational use. Results indicate that early season soil water conditions with little that early season soil water conditions with little crop cover of the soil were best monitored with the blue spectral band. As the season progressed and the crop canopy developed, the sorghum became an indicator of the available soil water; and the green and red spectral bands became more useful with red the best of all. Adjusting the film densities from the reflected imagery to account for variations in incoming radiation provided improved results in several cases. Thermal infrared radiation may possibly be the most valuable tool for may possibly be the most valuable tool for widespread soil water evaluation since it seems less affected by difference in vegetative and soil surfaces. (Skogerboe-Colorado State) W76-01067

SOIL TEMPERATURE MODELING USING AIR TEMPERATURE AS A DRIVING MECHANISM, Wyoming Univ., Laramie. Dept. of Civil Engineer-

ing.
V. R. Hasfurther, and R. D. Burman.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 1, p 78-81,
January-February 1974. 6 fig, 1 tab, 1 append.

Descriptors: *Model studies, *Mathematical models, *Soil temperature, *Air temperature, Temperature, Climatic data, Agriculture, Forecasting.
Identifiers: *Soil temperature modeling.

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A mathematical model for predicting soil tempera-ture from air temperature is developed and should have great utility because of the availability and economy of air temperature measurements as compared to soil temperature measurements. The mathematical model will predict daily average soil temperatures within approximately three degrees farenheit at depths of from 1 inch to 72 inches based on past measurements of average daily air temperature as reported by a standard weather bu-reau shelter. Prediction of future soil temperatures is largely limited by the accurate prediction of air temperatures in advance. The results of the mathematical modeling technique show that the deviations of predicted values from the actual values (smoothed values) were usually within three degrees and more often than not were less than three degrees in error. (Skogerboe-Colorado State)

CONTROLLING CENTER PIVOT SPRINKLERS FOR EXPERIMENTAL WATER APPLICATION, Agricultural Research Service, Fort Collins, Colo. D. F. Heermann.

Presented at 1974 Winter Meeting of the American Society of Agricultural Engineers, December 10-13, 1974. Chicago, Illinois. Paper No 74-2552, American Society of Agricultural Engineers. St. Joseph, Michigan, 23 p, 7 fig, 7 tab.

Descriptors: *Sprinkler irrigation, *Research equipment, Data collections, Application equip-ment, Application methods, Irrigation methods, *Irrigation practices, Irrigation, Farm management, Management, Water control, *Control systems. Identifiers: Center pivot sprinklers.

Irrigation systems and techniques are often required for various water treatments for water management research. Center pivot irrigation systems were successfully modified to vary water application depths on droplet size on small plots or entire sectors. The modifications included controls for varying travel speed and for automatically

starting and stopping individual sprinkler heads. The modifications made on center pivot systems for three different experiments were successfully used for applying water treatments. When systems were run at constant rotation speeds, the coefficient of variability was generally less than 20%. Water treatments applied with center pivot systems required minimal labor since the systems treatments as the systems passed over the plot areas. (Stogerboe-Colorado State)

THE UTILITY OF SURFACE TEMPERATURE MEASUREMENTS FOR THE REMOTE SENSING OF SURFACE SOIL WATER STATUS, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. For primary bibliographic entry see Field 2G. W76-01121

THE APPLICATION OF ICE PHYSICS TO GLA-

CIER STUDIES,
Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch. For primary bibliographic entry see Field 2C. W76-01250

APPLICATION OF ISOTOPE TECHNIQUES TO

GLACIER STUDIES, Alberta Univ., Edmonton. Dept. of Physics. For primary bibliographic entry see Field 2C. W76-01252

MECHANICAL SNAKE RIVER UNDISTURBED SOIL CORE SAMPLER,

Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center. C. W. Hayden, and C. W. Robbins. Soil Science, Vol 120, No 2, p 153-155, August 1975. 3 fig, 1 ref.

Descriptors: *Soil investigations, *Core drilling, Hydraulic conductivity, Power head, Sampling, rydraulic conductivity, rower nead, Samping, Tubes, Mechanical equipment, Soils. Identifiers: *Mechanical sampler, *Snake River Sampler, Undisturbed sampling, Power-driven sampler, Cutting tip, Split sleeve, Hand operation,

The hand-operated Snake River Sampler for obtaining undisturbed soil cores in the upper 50 cm of soil was reported in 1968. Described here was a a newer sampler which had the ability to sample bedrock at a depth of 5 m by adding an outside auger tube without having to pull the entire sam-pling equipment out of the soil. A direct-drive 9 hp psing equipment out of the soil. A direct-drive 9 np gasoline motor with a centrifugal clutch powered the drilling unit. A cutting tip permitted an inside sample tube to remain stationary while the outside auger tube removed the soil away from the sample. The sample tube and split sleeve holder had a slightly larger diameter than the spring steel cutting tip. This allowed the sample to slip into the split sleeve holder without any distortion or compaction. The dimensions described were optional paction. The dimensions described were optional, and it would be advisable to use a larger power unit if sampling to greater depths were necessary. The unit could be converted to, or mounted on, a small trailer. This made the sampler highly maneuverable for sampling in areas where larger units could not operate. Difficulty could be encountered in sampling very dry or gravelly soils. (Roberts-ISWS) W76-01272

CLASSIFYING STORM RUNOFF POTENTIAL WITH PASSIVE MICROWAVE MEASURE-

Agricultural Research Service, Chickasha, Okla. B. & Blanchard, J. W. Rouse, Jr., and T. J.

Water Resources Bulletin, Vol 11, No 5, p 892-907, October 1975. 3 fig, 3 tab, 23 ref.

Descriptors: *Storm runoff, *Microwaves, Soils, Watersheds(Basins), Soil moisture, Vegetation, Soil texture, Runoff coefficient, Remote sensing, Soil texture, kunon overticent, actione scassing, Runoff, Measurement, Hydrology. Identifiers: *Storm runoff potential, *Microwave measurements, Surface roughness, Vegetative cover, Watershed runoff, Microwave imaging.

The average microwave temperature of the watershed surface as detected by an airborne Passive Microwave Imaging Scanner (PMIS) was compared with the measured Soil Conservation Service (SCS) watershed storm runoff coefficient. Previous laboratory work suggested that microwave response to the watershed surface was influenced by some of the same surface charac-teristics that affect runoff, i.e., soil moisture, sur-face roughness, vegetative cover, and soil texture. In order to field test and develop relations between runoff potential and microwave response, several highly instrumented watersheds of approximately 1.5 to 17 sq km were scanned under wet- and dry-soil conditions in April and June 1973. The polarized (horizontal and vertical) scans at 2.8 cm wavelength provided the data base from which other values were calculated. The best relationship between runoff coefficients and PMIS tempera tures was observed when horizontally polarized temperatures from the near-dormant, early-growing season flight were used. Lower SCS coefficients seemed to be correlated with the cross-polarized response under dry watershed conditions late in the growing season and the difference in horizontal polarized response between wet conditions early in the growing season and dry conditions late in the growing season. (Roberts-(2W2) W76-01306

USE OF ERTS-1 IMAGERY TO INTERPRET THE WIND EROSION HAZARD IN NEBRASKA'S SANDHILLS,

Nebraska Univ., Lincoln. Conservation and Survey Div.

For primary bibliographic entry see Field 2J. W76-01309

AN EVALUATION OF SEDIMENT TRAP METHODOLOGY, Toronto Univ., Ontario (Canada), Dept. of Zoolo-

For primary bibliographic entry see Field 2J. W76-01313

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS, FEBRUARY

Canada Centre for Remote Sensing, Ottawa (Ontario). Data Acquisition Div. For primary bibliographic entry see Field 5A. W76-01324

A SURVEY FOR THE USE OF REMOTE SENSING IN THE CHEMICAL BAY REGION, Maryland Univ., Solomons. Chesapeak Biological For primary bibliographic entry see Field 5B. W76-01327

COMPARISON OF SOME CALCULATION METHODS FOR RAINWATER RUNOFF (VERGLEICH EINIGER BERECHNUNG-REGENWASSER-SMETHODEN VON KANALISATIONEN),

For primary bibliographic entry see Field 2A. W76-01426

EVOLUTION OF OPERATION CONTROL IN WATER TREATMENT (A VIZTISZTITASI TECHNOLOGIAK UZEMIRANYITASANAK FEJLODESE),
For primary bibliographic entry see Field 5D.
W76-01450

Field 7—RESOURCES DATA

Group 7B-Data Acquisition

A PHOTOGRAPHIC TECHNIQUE FOR MEA-SUREMENTS OF ATMOSPHERIC PARTICLES IN SITU FROM AIRCRAFT, National Center for Atmospheric Research,

Boulder, Colo.
For primary bibliographic entry see Field 2B.
W76-01472

GAMMA--THE PSYCHROMETER NON-CON-

STANT,
Atmospheric Environment Service, Calgary
(Alberta).

For primary bibliographic entry see Field 2D. W76-01473

A HYDROPHOBIC MEMBRANE PROBE FOR TOTAL PRESSURE AND PARTIAL PRESSURE MEASUREMENTS IN THE SOIL AT-

Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.

For primary bibliographic entry see Field 2G. W76-01480

7C. Evaluation, Processing and Publication

INVENTORY OF POTENTIAL AND EXISTING UPSTREAM RESERVOIR SITES, TAUNTON AND NARRAGANSETT BAY STUDY AREAS.

Soil Conservation Service, Amherst, Mass.
USDA and Massachusetts Water Resources Commission, January 1974. 194 p, 41 fig, 17 tab, 11 ref,

Descriptors: *Reservoir sites, *Reservoirs, *Potential water supply, *Massachusetts, Safe yield, Artificial lakes, Feasibility studies, Hydraulic structures, Hydrology, Cost analysis.
Identifiers: *Reservoir site inventory,
*Narragansett Bay, *Taunton Bay, Reservoir

Data on 81 potential and 160 existing reservoirs were presented. One of a series dealing with reservoir sites in Massachusetts dating back to 1965, the study covers a 699 sq mi area divided into 16 subwatersheds. The selection criteria for potential reservoir sites, including drainage areas between 0.5 and 50 sq mi, were documented. Sites were located on 7.5-minute quadrangle maps. A field reconnaissance was made at each site to determine the potential effects on man-made structures. An approximate total development cost was made for each site based on 1972 land values. Surficial geologic investigations were also made at each potential reservoir site. The hydrologic and hydraulic studies provided type of principal spill-way, the 100-year peak flow, and the safe yield of the reservoir for water supply purposes. Maps showing the location of each potential and existing reservoir as well as their respective drainage areas were presented for each subwatershed. For each were presented for each subwatershed. For each subwatershed for existing reservoir, a field reconnaissance was made to determine the physical condition of the structure and to assess the potential for expansion. Selected photographs were included, as well as information on ownership and use. (Terstriep-ISWS) W76-01269

STEP-DRAWDOWN TEST ANALYSIS BY COM-

PUTER, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-01300

USE OF ERTS-1 IMAGERY TO INTERPRET THE WIND EROSION HAZARD IN NEBRASKA'S SANDHILLS, Nebraska Univ., Lincoln. Conservation and Survey Div.

For primary bibliographic entry see Field 2J. W76-01309

CALIFORNIA HIGH WATER, 1972-1973, California State Dept. of Water Resources, Sacramento, Div. of Resources Development. For primary bibliographic entry see Field 2E. W76-01315

ADAMS COUNTY SURFACE WATER RESOURCES

Illinois Dept. of Conservation, Springfield. Div. of Fisheries. B. Dunn

December 1972, 64 n. 16 fig. 14 tab. 26 ref.

Descriptors: *Water resources, *Surface waters, *Illinois, *Data collections, Water pollution, Streams, Lakes, Climates, Geology, Drainage, Soils, Impoundments, Ponds, Water quality, Fisheries, Fish Recreation, Sport fishing, Commercial fishing, Boating, Public access, Hunting, Reservoir sites, Water levels. Identifiers: *Adams County(III).

Adams County, located in west-central Illinois along the Mississippi River, is 866 sq m in area. It has a population of 68,467 people, two-thirds of which reside in Qunicy. With the exception of industrialized Quincy, the county is agriculturally oriented. The climate is generally mild with an average annual temperature of 55F. Precipitation averages 35-36 in annually. Water resources total approximately, 267 artificial impoundments. approximately 2267 artificial impoundments (1533.8 acres), 35 natural lakes (840.8 acres), and 24 streams (625.5 acres). There are numerous pond and lake sites for potential recreational develop-ment. Nineteen potential lake sites have been proposed as feasible and an additional eight have been included in the McKee Creek Watershed Project. Recreation is generally centered along the Mississippi River where approximately 16,100 water are open to public use. Siloam Springs State Park is also heavily used. Sales of fishing and boating licenses have increased in the fishing and boating licenses have increased in the past few years, but hunting licenses sales have dropped due to the 1968 gun owners registration law. Water quality is generally good; pollution problems are not serious, although there are problem areas. Only one fish kill (undetermined origin) has been reported in recent years. Agricultural problems of soil erosion, pesticides, and animal waters probably present pages of a potenanimal wastes probably present more of a potential threat than industrial and municipal wastes. Development of recreational areas within the county seems promising. (Robinson-ISWS) W76-01317

HENDERSON COUNTY SURFACE WATER

Illinois Dept. of Conservation, Springfield. Div. of Fisheries.

December 1971. 86 p, 15 fig, 17 tab, 51 ref, 3 append.

Descriptors: *Surface waters, *Water resources, *Illinois, *Data collections, Streams, Lakes, Ponds, Impoundments, Rivers, Mississippi River, Porainage, Soils, Climates, Geology, Fish, Fishing, Sport fishing. Commercial fishing, Recreation, Boating, Hunting, Wildlife, Water quality, Water pollution, Thermal stratification, Damsites, Water levels, Public access.

Identifiers: *Henderson County(III).

Henderson County, located in northwestern Il-linois with a land area of 381 sq mi, is essentially separated into three distinct regions: A flat to un-dulating upland plain, a rugged bluff region, and the low-lying Mississippi River plain. The climate is characterized by a very wide range in tempera-ture and an abundant rainfall. Surface drainage is divided by the Mississippi and Illinois River systems, but the latter drains only 15 sq mi in the

extremed southeast corner of the county. The current surface water inventory of Henderson County, which includes all major streams and impoundments, is 12,753.7 acres or 5.2% of the total land area. The Mississippi River, on the Henderson County side of the main channel, has a total length County side of the main channel, has a total length of 36.4 miles with an area of 11,343.8 acres. On an acreage basis, approximately 54% of the 990.1 acres of impounded surface water is classified under private ownership. New Crystal Lake, with its 375 acres of marsh and open water, is the largest single surface water impoundment and is operated as a hunting and fishing club. Gladstone Lake, operated by the Illinois Department of Con-servation, is the only public impoundment offering multiple-use water oriented recreation. Henderson Creek is the major stream, draining approximately 583 sq mi in west-central Illinois. Boating, fishing and hunting are the most popular water-based sports. The future of Henderson County's surface water resources requires careful management of the existing surface waters so the greatest use of their potential can be realized. (Robinson-ISWS) W76-01318

METHODS AND DATA REQUIREMENTS FOR RIVER-QUALITY ASSESSMENT, Geological Survey, Portland, Oreg. For primary bibliographic entry see Field 5A. W76-01334

EFFICIENT SEQUENTIAL OPTIMIZATION IN WATER RESOURCES, Iowa Univ., Iowa City, Inst. of Hydraulic Research. For primary bibliographic entry see Field 6A. W76-01338

LAND-CAPABILITY CLASSIFICATION OF THE LAKE TAHOE BASIN, CALIFORNIA-NEVADA, A GUIDE FOR PLANNING, Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station. For primary bibliographic entry see Field 4A. W76-01346

SPECIAL FLOOD HAZARD REPORT: CAMP-BELL CREEK, GREATER ANCHORAGE AREA.

Army Engineer District, Anchorage, Alaska. For primary bibliographic entry see Field 4A. W76-01361

INFORMATION: PLAIN CREEK, ORANGE COUNTY, CALIFORNIA. Army Engineer District, Los Angeles, Calif For primary bibliographic entry see Field 4A. W76-01362

SPECIAL FLOOD HAZARD INFORMATION: BEAR AND EVANS CREEKS, REDMOND AND VICINITY, WASHINGTON. Army Engineer District, Seattle, Wash.

For primary bibliographic entry see Field 4A. W76-01363

FLOOD PLAIN INFORMATION: EIGHT MILE CREEK, VICINITY OF PARAGOULD, ARKAN-

Army Engineer District, Memphis, Tenn For primary bibliographic entry see Field 4A. W76-01364

FLOOD PLAIN INFORMATION: PART I BAYOU BARTHOLOMEW AND TRIBUTARIES, CITY OF PINE BLUFF, ARKANSAS. Army Engineer District, Vicksburg, Miss. For primary bibliographic entry see Field 4A. W76-01365

SPECIAL FLOOD HAZARD INFORMATION. WOLF LODGE CREEK AND TRIBUTARIES, VICINITY OF COUER D'ALENE, IDAHO. Army Engineer District, Seattle, Wash. For primary bibliographic entry see Field 4A. W76-01367

FLOOD PLAIN INFORMATION: POCOSHOCK AND POCOSHAM CREEKS, CITY OF RICHMOND AND CHESTERFIELD COUNTY,

Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W76-01368

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FLOOD PLAIN INFORMATION: CASPER, WYOMING, VOLUME III, NORTH PLATTE DIVER

Army Engineer District, Omaha, Nebr. For primary bibliographic entry see Field 4A. W76-01369

FLOOD PLAIN INFORMATION: ST. JOE AND ST. MARIES RIVERS, CITY OF ST. MARIES AND VICINITY, IDAHO. Army Engineer District, Seattle, Wash For primary bibliographic entry see Field 4A. W76-01370

SPECIAL FLOOD HAZARD REPORT: TO REVISE FLOOD PLAIN INFORMATION. METROPOLITAN REGION, DENVER COLORADO; VOLUME II: SAND, TOLL GATE AND LOWER CHERRY CREEKS, SOUTH PLATTE RIVER BASIN.

Army Engineer District, Omaho, Nebr. For primary bibliographic entry see Field 4A.

FLOOD PLAIN INFORMATION: PROCTORS CREEK, CHESTERFIELD COUNTY, VIR-GINIA.

Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W76-01372

INFORMATION: FLOOD PLAIN SAN LORENZO RIVER, BOULDER CREEK-FEL-TON, SANTA CRUZ COUNTY, CALIFORNIA. Army Engineer District, San Francisco, Calif. For primary bibliographic entry see Field 4A. W76-01373

FLOOD PLAIN INFORMATION: APTOS. TROUT AND VALENCIA CREEKS, CITY OF APTOS, CALIFORNIA.

Army Engineer District, San Francisco, Calif. For primary bibliographic entry see Field 4A. W76-01374

HYDROGRAPH SYNTHESIS USING MATHE-MATICAL MODELS, Wollongong Univ. Coll. (Australia). Dept. of Civil

Engineering. For primary bibliographic entry see Field 2A. W76-01418

AN EVALUATION OF THREE RAINFALL-RU-

NOFF MODELS, Monash Univ., Clayton (Australia). Dept. of Civil Engineering. For primary bibliographic entry see Field 2A.

PROBLEMS IN THE PROGRAMMED OPTIMISATION OF A HYDROLOGICAL CATCHMENT MODEL,
Commonwealth Scientific and Industrial Research

Organisation, Canberra (Australia). Div. of Land Use Research

For primary bibliographic entry see Field 2A. W76-01420

SIMULATION OF THE RAINFALL-RUNOFF PROCESS USING A HYSTERETIC INFILTRA-TION-REDISTRIBUTION MODEL, New South Wales Univ., Kensington (Australia).

School of Civil Engineering.
For primary bibliographic entry see Field 2A. W76-01421

FLOOD FREQUENCY DISTRIBUTION IN A CATCHMENT SUBJECT TO TWO RAINFALL PRODUCING MECHANISMS.

Queensland Irrigation and Water Supply Commission, Brisbane (Australia). Surface Resources Branch. For primary bibliographic entry see Field 2A. W76-01425

WATER POLLUTION MONITORING SYSTEM. (IN JAPANESE), For primary bibliographic entry see Field 5A. W76-01443

SAM: A SEWER SYSTEM MODEL FOR PUBLIC WORKS ENGINEERS,

CH2M/Hill, Corvallis, Oreg. For primary bibliographic entry see Field 5D. W76-01463

GEOMORPHOLOGY OF A GLACIATED FIRST-ORDER VALLEY IN SOUTH CENTRAL

NEW YORK,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2J. W76-01469

COASTAL UPWELLING EXPERIMENT - I AND II, SURFACE HYDROGRAPHIC FIELDS DATA REPORT.

Ronsenstiel School of Marine and Atmospheric Sciences, Miami, Fla. For primary bibliographic entry see Field 2L. W76-01496

8. ENGINEERING WORKS

8A. Structures

ENGINEERING THE BEAR SWAMP PROJECT, Main (Charles T.) Inc., Boston, Mass. For primary bibliographic entry see Field 6A. W76-01010

INSERTION OF POLYETHYLENE PIPE RENEWS DAMAGED SEWER,

Montgomery Water and Sanitary Sewer Board,

Public Works, Vol. 104, No. 2, p 64-65, February, 1973. 5 fig.

Descriptors: *Plastic pipes, *Sewers, Plastics, Concrete pipes, Damages, Costs, Repairing, Identifiers: Polyethylene pipe.

A 22-inch polyethylene pipe lining has been used to renew a 24-inch reinforced concrete gravity sewer main damaged by hydrogen sulfide. The damaged portion of the main extended 754 feet in a straight line and veered at a 45 degree angle for an additional 96 feet. Added to the cost and inconvenience of replacement were the factors of infinitation of storm water and exilitation of sewage into the surrounding terrain. Since the flow rate of the mentioned polyethylene pipe was the same as that for the damaged sewer, the polyethylene lin-ing developed by the Du Pont Company was used for repairs. The three pipe sections were pulled by a winch, operating through a manhole on the up-grade of the run, into position at a rate of 30 to 40 feet per minute. The house laterals were then connected to the plastic pipe by inserting 4-inch polyethylene pipe through the old concrete lines and making house connections into the repaired main through the use of remote connector fittings. The entire job afforded a savings of about \$10,000. (Sandoski-FIRL) W76-01050

PVC PIPE CUTS COLORADO DISTRICT'S

FLOW COST, North Table Mountain Water and Sanitation District, Colo. For primary bibliographic entry see Field 8G. W76-01063

TRICKLE IRRIGATION DESIGN PARAME-

Utah State Univ., Logan. Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 3F.
W76-01087

INVENTORY OF POTENTIAL AND EXISTING UPSTREAM RESERVOIR SITES, TAUNTON AND NARRAGANSETT BAY STUDY AREAS. Soil Conservation Service, Amherst, Mass For primary bibliographic entry see Field 7C. W76-01269

WATER RESOURCES ASPECTS OF THE PROPOSED PERKINS STATION NUCLEAR POWER PLANT.

North Carolina Dept. of Natural and Economic Resources, Raleigh. Water Resources Planning

Technical Report No IV-21-C (NO 1), North Carolina Water Plan, Area Management Plans, The South Atlantic Gulf Region, Yadkin-Pee Dee River Basin, 1974. 69 p. 18 tab, 1 map, 10 plates, 21

Descriptors: *Nuclear powerplants, *Water resources, *North Carolina, Hydrologic aspects, Withdrawal, Consumptive use, Low flow, Downstream, Water quality, Streamflow, Water resources development, Management, Hydrology, Recycling, Analysis, Sites, Discharge(Water), Waste disposal, Industrial wastes, Effluents, Water pollution.

Identifiers: *Perkins Power Plant, *Yadkin River(NC), Water resources management, Downstream use, Alternative sites.

A study was conducted to evaluate the potential effects of Duke Power Company's proposed Perkins Nuclear Station on the Yadkin River in Davie County, North Carolina, and to investigate 14 alternate sites. Intensive hydrological studies were performed and effects on water quality were investigated. The Yadkin-Pee Dee River is a valuable natural resource in North Carolina, and is con sidered more important to future industrial development than any other stream in the state. The Yadkin River, particularly in the vicinity of the Yadkin College gage, is less affected by drought conditions than other large streams of North Carolina. It is a dynamic and dependable river which should have formed the backbone of future comprehensive water resources planning in the Piedmont Region. As proposed, the Perkins Nuclear Station would withdraw water from the Yadkin River when the flows were above 330

Field 8—ENGINEERING WORKS

Group 8A-Structures

cubic feet per second (cfs). Withdrawals would be in the range of 50-315 cfs. During more critical conditions about 110 cfs of the water withdrawn would be consumed by evaporation, reducing the total river flow about 50%. The study was directed toward determining what conditions should be placed on the operation of the Perkins Station in order to minimize its effects on the state's water resources and what suitable alternative sites may be available. (Roberts-ISWS) W76-01274

THE HYDRAULIC CHARACTERISTICS OF PLASTIC LAND DRAINAGE PIPE,

Ministry of Agriculture, Fisheries and Food, Cambridge (England). Field Drainage Experimental For primary bibliographic entry see Field 8G.

NEEDS AND PLANS IN THE DEVELOPMENT OF URBAN AND RURAL SEWER SYSTEMS (POTRZEBY I PLANY ROZBUDOWY SIECI KANALIZACYJNEI W MIASTACH OSIEDLACH),

J. Klossowski. Gaz, Woda i Technika Sanitarna, Vol 47, No 1, p 20-21, 1973, 4 tab.

Descriptors: *Planning, *Sewerage, Population, Pipelines, Water, Installation.
Identifiers: Poland.

The size and investments required for urban and rural sewer system installation and/or expansion in Poland have been announced after statistics of the 1965-1970 five-year plan were tabulated. Data for the 1975-1985 period in terms of sewer length per inhabitant as related to the size of the settlement population are projected. Investment requirements are broken down over three periods, includ-ing 1970-1975, 1976-1980, and 1981-1985, according to pipeline length requirements and pump over costs-about 10 percent of that for sewage network installation. Theoretically, sewage system planning and development constitutes an integral part of their housing development and the sewage system pipeline length should accomodate all who receive public water. (Sandoski-FIRL) W76-01294

DEVELOPMENTS IN TRENCH-TYPE TUNNEL CONSTRUCTION,

Palmer and Baker Engineers, Inc., Mobile, Ala. W. F. Palmer, and K. C. Roberts.

Journal of the Construction Division, American Society of Civil Engineers, Proceedings paper No 11183, Vol 101, No CO1, p 37-49, March 1975. 8

Descriptors: *Underwater, *Construction, *Tunneling, *Tunnels, *Excavation, History, Descriptors: Foundations Identifiers: *Trench-type tunnels.

The basic concept of the subaqueous trench-type tunnel dates back to antiquity. It is known that a tunnel of this type was constructed in Babylon in 2180-2160 B.C. The modern revival of this old idea dates from before 1854. A review is presented of the various methods of construction proposed in the years following, culminating in the construction of the first true trench-type tunnel, the Detroit Tunnel of the Michigan Central Railroad (1906-1910). Construction of this tunnel and other early tunnels--i.e., the Posey Tube, Alameda (1926-1928), The Detroit-Windsor Tunnel (1928-1930), the Bankhead Tunnel, Mobile, Ala. (1939-1940), and the Maas River Tunnel (1938-1941)-is described in general terms. The inherent advantages of trench-type tunnels were demonstrated in these early works and led to the widespread use of this kind during the ensuing years. (Bell-Cornell)

ZUMBRO RIVER BASIN, MINNESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, St. Paul, Minn. Available from National Technical Information Service, Springfield, Va 22161 as EIS-MN-73-1524-F, \$5.00 in paper copy, \$2.25 in microfiche. September 19, 1973. 87 p, 3 map.

Descriptors: *Channel improvement, *Levees, *Flood control, Turbidity, Birds, Mammals, En-vironmental effects, Fish, Channels, Flood plain insurance, Flood protection, Floods, Flood plains, Environment, Flood proofing, Reservoir storage, *Minnesota.
Identifiers: *Environmental Impact Statements,

*Rochester(Minn).

The project entails approximately 10 linear miles of channel modification on the South Fork Zumor channel modification on the South Fork Zumbro River, Bear Creek, and Cascade Creek in Rochester, Minnesota, with supplementary levee and pump station construction, flood proofing of municipal buildings, and regulation of the remaining flood plain areas. The environmental impact of the flood control plan would most importantly the state of result in flood protection for the residents of Rochester. The savings from flood damages balance against the disruption to the greenbelt cor-ridors and loss of natural riverine habitat over a distance of 10 linear miles. A net loss to the aesthetics of the human environment is also likely to result. Other adverse environmental effects in clude turbidity of water during construction; disruption of community affairs; relocation of two residences and eight businesses; and disruption of riparian and aquatic ecosystems with reduction of bird, mammal, and fish populations attendant from loss of habitat. Alternatives include flood proofing of existing and new structures; flood warning systems; permanent evacuation; flood in-surance; flood plain regulation; large reservoir headwater reservoir storage and proved land management practices; channel im-provements and levees; and considerations of these measures. Comments were received from the Environmental Protection Agency, Depart-ment of Interior, and the Sierra Club among other institutions. (Gagliardi-Florida) W76-01411

BAYOU BODCAU AND TRIBUTARIES, KANSAS AND LOUISIANA ASSOCIATED WATER FEATURES, RED RIVER, BAYOU BODCAU, FLAT RIVER, RED ETC...(FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, New Orleans, La. Available from National Technical Information Service, Springfield, Va 22161 as EIS-LA-73-1764-F, \$4.50 in paper copy, \$2.25 in microfiche. November 8, 1973. 84 p, 5 fig, 6 tab.

Descriptors: *Flood control, *Flood protection, *Flood frequency, *Construction, Fish, Wildlife, Wildlife habitats, Habitats, Forestry, Flood plain zoning, Flood plain insurance, Arkansas, Loui-

Identifiers: *Environmental Impact Statements. *Bayou Bodcau(Ark-La).

The project provides for the construction of a comprehensive flood control plan in the Bayou Bodcau. Flat River, Red Chute Bayou, and Loggy Bayou Basin. The plan creates flood protection against a headwater flood having a frequency of occurrence of 25 years. Construction of the recommended features all require physical alteration to segments of various bodies and will impose changes in use on some land areas. There will be adverse effects on the fish, wildlife, and forestry resources because of actual construction of project features and a result of changes in land use in the area to be protected. Many structural and nonstructural alternatives were considered including dams and reservoirs, modification of the Bayou Bodcau Reservoir, flood plain zoning, flood plain insurance, and payment or evacuation. (Denvir-Florida)

SAINT FRANCIS BASIN PROJECT, ARKANSAS AND MISSOURI, (ENVIRONMENTAL IMPACT

Army Engineer District, Memphis, Tenn. Available from the National Technical Information Service, Springfield, Va 221 as EIS-MO-73-1946-F, \$9.00 in paper copy, \$2.25 in microfiche. December 17, 1973. 266 p, 4 plta, 13 tab, 2 append.

Descriptors: *Environmental effects, *Flood routing, *Detention reservoirs, *Missouri, *Arkansas, Reservoirs, Reservoir construction, Flood control, Drainage, Levees, Flood protection, Check structures, Control structures, Multiple-purpose Water management(Applied), Aesthetics, Natural resources, Recreation, Public health, Agriculture, Fish, Water birds, Waterfowl, Wildlife habitats. Groundwater basins. Federal government.
Identifiers: *Environmental Impact Statements,

*Dam effects.

The project involves the completion of a reservoir in the Ozark foothills in southeast Missouri and channel improvements, and control structures in the alluvial valley in southeast Missouri and northeastern Arkansas. Predominate portions to be affected are rural, agricultural areas in a flat basin which has experienced frequent flooding. Projected impacts of the project involve a reduc-tion in the frequency and duration of flooding with resultant economic growth, improvement of out-door recreation, reduction of health hazards, and mitigation of fish and wildlife losses. Adverse environmental effects include increases in stream turbidity, reduction in fishery values, impairment of aesthetics, disruption of the benthic communi-ty, loss of wildlife and windscreens because of removal of vegetation, erosion, and potential pollution. Less feasible alternatives considered were: (1) additional reservoirs. (2) floodplain management-zoning, (3) acquisition of flowage easements, (4) no action, and (5) discontinuance of maintenance. The present generation will sacrifice a variety of natural resources to gain long-term agricultural uses. Changes in land use will not bring about permanently irreversible commitments of the environmental resources, but the diversity of uses will be reduced. Comments generally expressed concern over loss of outdoor recreation, and harm to wildlife. (Fernandez-Florida) W76-01414

PREDICTION OF THE EFFECTS OF THE FLOODWATER OF THE OLONA RIVER IN TICINO (PREVISIONI SUGLI EFFETTI DELLA IMMISSIONS DELLE ACQUE DI PIENE DELL' OLONA IN TICINO), For primary bibliographic entry see Field 4A.

W76-01447

FORCE MAIN RUNS OBSTACLE COURSE. For primary bibliographic entry see Field 5D.

ON THE MINIMUM SIZE OF NATURAL-DRAFT DRY COOLING TOWERS FOR LARGE POWER PLANTS,

Cornell Univ., Ithaca, N.Y. Energy Project. F. K. Moore.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-227 819, \$4.00 in paper copy, \$2.25 in microfiche. Paper No 72-18, August 1972. 32 p, 6 fig, 2 tab, 8 ref. NSF GI-34776

Descriptors: *Cooling towers, *Engineering struc-tures, *Powerplants, Electric powerplants, Heat transfer, Cooling, Evaporation, Water cooling, Engineering, Reynolds number, Froude number, Design standards.

Identifiers: *Natural draft cooling towers, Dry cooling towers, Minimum size.

A simple scaling law was derived which relates size, shape, drag coefficient and performance for natural-draft dry cooling towers. The tower was viewed as a gasdynamic duct, and the flow was analyzed by a perturbation theory for small temperature differences and flow Mach numbers. For perature differences and flow Mach numbers. For given drag, temperature performance, and duct area ratio, height was inversely proportional to the square of flow area. Adapting standard heat-exchanger design relationships and postulating a Reynolds' analogy connecting friction and heat transfer, drag and performance were related to each other, and the gasdynamic scaling law. A 'size function' was found, which has a minimum at a cartisular size with transcritions of the adaptive transcritions. a particular air exit temperature, for a given water exit temperature. Thus, technical requirements for minimum size were derived. Absence of water-side resistance, full counterflow equivalence and minimum 'size function' helped to define this minimum. Open-ended possibilities are the reduccommunities. Open-ended possibilities are the reduc-tion of fruction factor, and especially, increase of relative exchanger entrance area, which can powerfully reduce drag and hence improve draft. (Sims-ISWS) W76-01488

SCALING LAW FOR DRY COOLING TOWERS WITH COMBINED MECHANICAL AND NATU-RAL DRAFT.

Cornell Univ., Ithaca, N.Y. Energy Project.

F. K. Moore.

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Available from the National Technical Informastandor from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-227 814, \$4.00 in paper copy, \$2.25 in microfiche. Paper No 72-19, August 1972. 28 p, 1 fig, 2 ref. NSF GI-34776.

Descriptors: *Cooling towers, *Engineering structures, *Powerplants, Electric powerplants, Heat transfer, Cooling, Engineering, Reynolds number,

Froude number, Design standards.

Identifiers: *Natural draft cooling towers, *Mechanical draft cooling towers.

Following the theme of an earlier report, the gasdynamic performance equation for large-scale dry cooling towers was generalized to include mechanical draft was well as natural draft. A sequence of four elements, heat-exchanger, fan, heat-exchanger, and fan, were contemplated in the final result, which thus included both induced draft and forced draft towers are civil covers. The draft and forced-draft towers as special cases. The result consisted of a zero-order formula suitable for scaling tower configurations, together with a set of correction terms of first order in tempera-ture rise. These served both to evaluate the accuracy of the zero-order formula, and to compare systems which are nearly equivalent gasdynami-cally. In particular, it was found that a forced-draft system requires slightly less power than the cor-responding induced-draft tower. That is, the effect of a heat exchanger on a downstream fan is much greater than that of a fan on a downstream heat exchanger. Fan power, in ratio to heat rejected, is equivalent to tower draft height, but may be supplied at any duct area; thus, compact fans, or other propulsive devices, are gasdynamically feasible. (Sims-ISWS) (Sims-ISWS) W76-01490

8B. Hydraulics

ELONGATION CHARACTERISTICS OF COR-RUGATED PLASTIC TUBING, Ohio State Univ., Columbus. For primary bibliographic entry see Field 3F. W76-01064

WATERHAMMER CONSIDERATIONS FOR PVC PIPELINE IN IRRIGATION SYSTEMS, Certain-Teed-Products Corp., Valley Forge, Pa. For primary bibliographic entry see Field 3F W76-01066

TRICKLE IRRIGATION DESIGN PARAME-

Utah State Univ., Logan. Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 3F.

FLOATABLE BREAKWATER.

W76-01087

R. B. Fuller.
U.S. Patent No 3,863,455, 3 p, 11 fig, 5 ref; Official Gaz 12 of the United States Patent Office, Vol 931, No. 1, p 73, February 4, 1975.

Descriptors: *Patents, *Breakwaters, *Shore protection, Ocean waves, Erosion, Beach erosion.
Identifiers: *Wave action.

A floatable breakwater comprises a flexible tubular element supported upon a number of water buoyant rings at the surface of the water so that the envelope can be filled with water. Both ends of the envelope are open and have drawstrings at-tached thereto which in turn are anchored to secure the breakwater in position. The envelope has sufficient flexibility to enable the rings to move with respect to each other in an accordianlike movement. The breakwater is positioned in the water with its longitudinal axis angularly dispused to the direction of the wave movement and floating at such a depth that the breakwater will be filled with water through its open ends so as to be extendable and contractable axially by the relative movement of the annular members within the envelope when the breakwater is acted upon by waves. (Sinha-OEIS) W76-01130

PREDICTION OF FLOW DEVELOPMENT ON

SPILLWAYS, Karlsruhe Univ. (West Germany). Institut fuer

Hydromechanik.

Hydromecnanuk. R. J. Keller, and A. K. Rastogi.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY9, Proceedings Paper No 11581, p 1171-1184, September 1975. 9 fig, 1 tab, 21 ref, 2 append.

Descriptors: *Spillways, *Numerical analysis, *Boundary layers, *Air entrainment, Open channel flow, Turbulence, Hydraulics, Hydraulic structures, Design, Design flow, Velocity, Flow resistance, Roughness(Hydraulic), Aeration, Mathematical models.

A mathematical model for the flow development upstream of the region of air entrainment on a spillway was developed. The model was based on numerical solutions of the time-averaged twodimensional form of the Navier-Stokes equations. Predictions from the model of mean velocity dis-tributions, boundary layer growth, and water surface profiles were compared with experimental data, both model and prototype. Excellent agree-ment was obtained. Furthermore, it was shown conclusively that self-aeration in a spillway flow commenced at the point where the bed induced turbulence reached the free surface. (Adams-ISWS) W76-01255

CHARACTERISTICS OF A CIRCULAR JUMP IN A RADIAL WALL JET,

Asian Inst. of Tech., Bangkok (Thailand). Div. of Asian Inst. of recht, Baggook (Halanda). Div. of Water Resources Engineering.

A. Arbhabhirama, and W. C. Wan.
Journal of Hydraulic Research, Vol 13, No 3, p 239-262, 1975. 14 fig. 5 ref, 1 append.

Descriptors: *Jets, *Hydraulic jump, *Energy dissipation, *Boundary layers, *Supercritical flow, Theoretical analysis, Laboratory tests, Reynolds number, Froude number, Flow, Subcritical flow, Velocity, Turbulent flow, Mathematical studies. Identifiers: *Radial wall jet, Circular hydraulic

The flow resulting from an axisymmetric jet impinging on a smooth horizontal flat surface is called a radial wall jet. When supercritical radial flow changes to subcritical flow in this jet, a circu-lar hydraulic jump is formed. This can be used as an energy dissipator. Expressions for the energy dissipation and location of the jump were derived for a steady, incompressible and uniform flow, neglecting friction forces on the boundaries and assuming hydrostatic pressure distributions. The experimental verification was done using diesel oil and nozzle diameters varying from 1 to 3.75 inches for the Reynolds number in the range of 10,000 to 80,000. The experimental results satisfactorily verified the theoretical characteristics of the radial wall jet and circular hydraulic jump. The boundary layer, which developed outward from the stagnation point of the jet, had important effects on the radial flow profile. (Singh-ISWS) W76-01267

CONSTRUCTION OF A SPILL CHANNEL AND EXPERIMENTAL DETERMINATION OF SPILL SPREADING RATES OF FOUR NON-HAZARDOUS CHEMICALS ON WATER.

Lowell Technological Inst., Mass. Dept. of Mechanical Engineering.

Available from the National Technical Informa-

\$4.50 in paper copy, \$2.25 in microfiche. Report No DOT/TST-75-18, March 1974. 53 p, 32 fig, 18

Descriptors: *Oil spills, *Laboratory tests, *Open channels, Waves(Water), Steady flow, Velocity, Hydraulic models, Laboratory equipment, Instru-mentation, Measurement, Photography, Path of pollutants, Data collections, Water pollution

Identifiers: *Spill channels, Spreading rates, Soybean oil, Tetrahydronaphthalene, Dicotyl phthalate, 1-hexadence, Wave generator.

An experimental study of the spill spreading rates of various representative hazardous, nonmiscible liquids on water was reported. These liquids were soybean oil, tetrahydronaphthalene, dioctyl phthalate, and I-hexadence. A 40-foot spill channel was constructed in which various wavelength and period waves could be generated. The spill fluids period waves could be generated. In a spill fullist were released at several different steady, controlled rates upon the water surface, with and without waves present. The resultant spill was photographed using timed motion picture photography. The spill spreading rate was studied as a function of spill fluid viscosity and density, spill specific transfer and the standard standard spill spills. release rate, and water surface conditions. Nongeneralized results suitable for spill spread rate prediction were given. Recommendations for additional study were listed. (Humphreys-ISWS) W76-01320

TURBULENCE MEASUREMENT OF A FLOW WITH SUSPENDED SOLID PARTICLES,

Gifu Univ., (Japan). Dept. of Civil Engineering. S. Komura, and M. Kubota. Water Resources Bulletin, Vol 11, No 5, p 871-880, October 1975. 8 fig. 1 tab, 15 ref.

Descriptors: *Turbulence, *Turbulent flow, *Laboratory tests, *Suspended solids, Eddies, Flumes, Roughness(Hydraulic), Measurement, Anemometers, Instrumentation, Hydraulics, Sedi-

Identifiers: *Hot-film probe, Macroscale.

Data on turbulence properties of flow with suspended solid particles were collected, analyzed, and reported. The turbulence data were collected using a quartz-coated, wedge-shaped hot-film probe in a laboratory flume with Toyoura sands as the solid particles. Results of these experiments indicated that the relative intensity of turbulence near the flume bed was less with suspended solid particles than with no suspended solid particles. It was observed that the

Field 8-ENGINEERING WORKS

Group 8B-Hydraulics

macroscale of eddy decreased as the mean crosssectional suspended sediment increased, and the ratio of decreasing macroscale of eddy to increasing suspended sediment concentration was large relationship was also developed between relative sediment concentration and the relative intensity of turbulence. (Bhowmik-ISWS) W76-01470

REGIME EQUATIONS AND TIDAL INLETS, Coastal Engineering Research Center, Fort Belvoir, Va. For primary bibliographic entry see Field 2L. W76-01484

THE EFFECT OF BREAKER SHAPE ON IMPACT PRESSURES IN SURF,
Chicago Univ., Ill. Dept. of the Geophysical

Sciences. For primary bibliographic entry see Field 2L. W76-01499

8C. Hydraulic Machinery

AUTOMATED VALVES FOR SURFACE IR-RIGATION PIPELINES,

Agricultural Research Service, Kimberly, Idaho, Snake River Conservation Research Center For primary bibliographic entry see Field 4A.

COUNTY'S TRIPLE-THREAT HYDRAULIC BACKHOE.

Public Works, Vol 104, No 4, p 95-96, April, 1973.

Descriptors: *Construction equipment, *Construction, Soils, Storm drains, Sewers, Identifiers: Barron County(Wisconsin), Hydraulic

A Drott Model 40YR Cruz-Air hydraulic backhoe, equipped with two interchangeable buckets, a 60-inch bucket, and a Drott 4-in-1 bucket reduced project costs, cut machine rental expenditures, and saved time on various assignments in Barron County, Wisconsin. The Cruz-Air is used in digging test holes for sand and gravel deposits as well as trenching, placing pipes, and backfilling on storm sewer tasks. It can dig and load back-run gravel and sand, lift and place pilings and timbers, and prepare final grades for curbs, gutters, or side-walks with accuracy within 1/2 inch. This machine has replaced a tractor backhoe, a crawler crane, and a front-end loader. (Sandoski-FIRL) W76-01291

SUBMERSIBLE LIFT STATIONS CUT PUMP MAINTENANCE COSTS.

Water and Sewage Works, Vol 122, No 8, p 64-65, August, 1975.

*Sewage Descriptors: *Pumps, treatment. *Waste water *Sewerage, treatment, *Maintenance costs, Operating costs, Monitoring, Control systems, Sewer systems, California. Identifiers: *Submersible Foster pumps, City(Calif)

Of 34 lift stations handling sewage for Foster City, California, 24 have recently been converted to the submersible pump type. About ten years ago, when the first pumping stations were installed in the city, types of stations included wet well with shaft-driven pumps, wet well/dry well, pneumatic ejector, and submersible. Maintenance and repair costs were high, and the majority of the pumps were difficult to remove for inspection or service. Moisture seeping into motors was a main problem. Since the installation of new Flygt submersible pumps, maintenance costs have been lowered con-siderably. Well structures have been modified and precise records are being kept on all stations and pumps. Semi-annually, each pump is removed from service and inspected. The pumps are washed and sandblasted down to bare metal, then exterior surfaces are recoated with bitumastic epoxy. This coating is necessary each six months to protect against corrosion from the high salt con-tent of the waste water. Each submersible lift station has two or three pumps, so that at least one is available when the other is removed for maintenance work. An automatic control system for the sewage handling equipment pinpoints conditions at each pumping station and warns when there is a high liquid level in any well. Emergency genera-tors are also available in the case of power failure. (Kramer-FIRL) W76-01460

QUICK RELEASE SAFETY TRAP.

J. C. McIlroy. United States Patent 3,908,208. Issued September 30, 1975. Official Gazette of the United States Patent Office, Vol 938, No 5, p 2010, September, 1975, 1 fig.

Descriptors: *Waste water treatment, *Patents, *Pipes, *Construction materials, Plastic pipes, Equipment.

A quick release trap for connecting waste water return plumbing lines has been patented. An arcuately curved pipe bend portion is described, havately curved pipe bend portion is described, hav-ing a pair of upwardly opening leg portions, sized to receive a corresponding one of a pair of downwardly pointed pipes. Each leg portion has several segmented and frangible end portions. Each respective leg portion is attached to its opposed pipe by a pair of engageable clamps. A threaded fastener is used to tighten each clamp and secure the tight attachment. The bend portion and leg portions are constructed of a high density polyethylene substance; light is therefore admitted through their walls so that a visual inspection of the condition of the pipe bend is possible before removal for cleaning. Each leg portion is readily detachable from its opposed pipe, and a water hose or other cleaning instrument may be inserted to remove or dislodge clogging material from the bend portion. (Kramer-FIRL) W76-01467

8D. Soil Mechanics

MECHANICAL SNAKE RIVER UNDISTURBED SOIL CORE SAMPLER.

Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Cent For primary bibliographic entry see Field 7B.

SACRAMENTO RIVER BANK PROTECTION PROJECT, CALIFORNIA (FINAL ENVIRON-MENTAL IMPACT STATEMENT).

Army Engineer District, Sacramento, Calif. Available from National Technical Information Available Holi National Technical Internation Service, Springfield, Va 22161 as EIS-CA-73-1046-F, \$5.50 in paper copy, \$2.25 in microfiche. November 1972, 118 p.

Descriptors: *Levees, *Erosion control, *Flood protection, *Bank protection, Flood plains, Vegetation, Reservoirs, Erosion, Floods, Fish, Reservoir storage, *California, Flood control, Environmental effects, Flooding wildlife, Berms,

Recreation, Aesthetics.

Identifiers: *Environmental Impact Statements, *Collinsville(Calif), Chico(Calif).

The proposed project entails construction of levee protection and erosion control works along the Sacramento River and its tributaries from Collinsville to Chico, California. The project will safeguard extensive areas in the Sacramento River flood plain from potential widespread damage and loss of life due to flooding. Protection of the levees will result in loss of riparian vegetation and as-sociated fish and wildlife, recreation and scenic values. The maintenance practices will also result in removal of vegetation on a regular basis. The bank protection program and accompanying maintenance will prevent the continuing erosion of levees and loss of riparian lands and vegetation. The primary adverse environmental effect is the loss of aesthetic, wildlife and other natural riparian values. Such values would ultimately be lost to erosion if the project is not constructed. Alterna tives considered include levee setbacks, revised levee encroachment standards, construction of additional reservoir storages, construction of additional reservoir storages, construction of new berms, further bank and berm protection, and deferring or terminating the work. (Gagliardi-W76-01409

8E. Rock Mechanics and Geology

POSTDEPOSITIONAL INJECTIONS OF URANI-UM-RICH SOLUTIONS INTO EAST PACIFIC RISE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric

Science, Miami, Fla.

H. Rydell, T. Kraemer, K. Bostrom, and O. Joensuu.

Marine Geology, Vol 17, No 3, p 151-164, Oct., 1974, 2 fig, 4 tab, 41 ref.

Descriptors: *Analytical techniques, *Isotope studies, *Heavy metals, *Uranium, *Sediments, *Radioisotopes, *Marine geology, *Sedimentation rates, Spectrometry, Solvent extractions, Ion exchange, Electrodeposition, Volcanoes, Tracers. Identifiers: *Thorium, *East Pacific Ridge, *Sediment dating, *Marine sediments, *Alphaparticle spectrometry.

An 8.5 meter long apparently undisturbed core from a hilltop on the crest of the East Pacific Rise has uranium and thorium isotope distributions that are very unusual. The core is very poor in Thorium 232, and rich in uranium, particularly at the 500 centimeter level, where a value of about 150 parts per million is reached. At the same depth the Thorium 230XS reaches very large negative values. These facts could be accounted for if one assumes that solutions rich in uranium and poor in thorium had been predepositionally injected into the sediments about 90,000-110,000 years ago. The top of the sediment received much of its uranium from seawater, judging from the Uranium 234:Uranium 238 ratio. Possibly carbonate rich solutions were the carriers of the injected uranium. (Kemp-Vanderbilt) W76-01098

GENERALIZED GEOLOGIC FRAMEWORK OF THE NATIONAL REACTOR TESTING STA-TION, IDAHO,

Geological Survey, Reston, Va. R. L. Nace, P. T. Voegeli, J. R. Jones, and M. Deutsch

Supt. of Documents, GPO, Wash. D. C. 20402 Price \$2.90. Professional Paper 725-B, 1975. 49 p, 10 fig. 10 tab, 21 ref.

Descriptors: *Hydrogeology, *Engineering geology, *Geological surveys, *Nuclear reactors, *Idaho, Planning, Construction, Geologic units, Geologic formations, Stratigraphy, Sampling, Core drilling, Core logging, Sedimentology, Geology, Water supply, Groundwater, Waste Geology, Water supply disposal, Nuclear wastes.

The Geologic framework of the NRTS (National Reactor Testing Station), Idaho, controls the amount and availability of the water supply, the methods and efficiency of obtaining water, and the behavior of waste materials that are disposed of on the ground and beneath the land surface. This

framework also affects the selection of construction sites and the operation of reactors and other facilities. Basalt of the Snake River Group of Quaternary age is exposed in about three-fourths of the station area. The basalt, typically gray to black, blusih-black, brown and brick red, ranges from dense to porous and highly vesicular. It oc-curs in relatively thin interlocking flows; most of the flows are the relatively smooth ropy type (pahoehoe), but a few flows are blocky basalt (aa). Detailed factors of the geologic framework that would directly influence site selection, engineering design and construction, and operation of reactors were studied chiefly at specific localities on the station. These factors included the behavior of earth materials during drilling, the availability of raw materials for construction, and the stability of earth materials in excavations--under stress and under a range in moisture conditions. The Snake River Plain, including the NRTS, is subject to occasional seismic tremors; the oldest recorded shock occurred in 1884. (Woodard-USGS) W76-01191

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PRINCIPLES OF DIMENSIONING THE SUP-PORTING SYSTEM FOR THE 'NEW AUSTRI-AN TUNNELLING METHOD',

L. V. Rabcewicz, and J. Golser. Water Power, Vol 25, No 3, p 88-93, March, 1973. 6 fig, 28 ref.

Descriptors: *Tunneling, *Tunnel construction, Rock mechanics, Safety factors, Stress. Identifiers: Austria.

Tunneling experience during the last ten years in Austria has proved the advantage of the 'New Austrian tunneling method' (NATM) over other methods, particularly in unstable rock. NATM is based on the principle of taking utmost advantage of the capacity of the rock to support itself, by carefully and deliberately controlling the forces in the readjustment process which takes place in the surrounding rock after a cavity has been made, and adapting the chosen support accordingly. Generally two methods of support are carried out. The first is a flexible outer arch designed to stabilize the structure accordingly, and consists of a symmetrically anchored rock arch with surface protection mostly by shotcrete, possibly rein-forced by additional ribs and closed by an invert. The behavior of the protective support and the surrounding rock during the readjustment process is controlled by a sophisticated measuring system. The second means of support is an inner arch consisting of concrete, and is generally not carried out before the outer arch has reached equilibrium. Its aim is to establish or increase the safety factors as necessary. The carrying capacity of the outer arch can be decided by the curve characteristic for any given type of rock and primary stress condition. At any intersection between the radial stress and the carrying capacity curve, equilibrium is reached for the respective support resistance. It is a particular feature of the NATAM that the intersections always take place at the descending branch of the curve. Should a stiffer type of support be chosen for the outer arch, the intersection with the carrying capacity curve is bound to rise while the safety factor simultaneously decreases. The minimum carrying capacity of the inner arch is decided by the smallest lining thickness that will allow suitable compaction of the concrete. Should a greater radial stress be required, the thickness can be chosen according to required radial stress and the required safety factor. Once the carrying capacity of the outer arch has been established for certain standard section, the means of strengthening can be chosen and computed accordingly. (Sandoski-FIRL) W76-01281

SF. Concrete

INSTALLATION CHECKS ON 4-INCH (102 MM) CORRUGATED POLYETHYLENE DRAIN TUB-

Soil Conservation Service, Upper Darby, Pa. For primary bibliographic entry see Field 3F. W76-01071

CHAMBER METHOD OF SUBSURFACE AND DRIP IRRIGATION, Massachusetts Univ., Amherst. Dept. of Food and

Agricultural Engineering.
For primary bibliographic entry see Field 3F. W76-01076

INVESTIGATION OF PREGNATED CONCRETE PIPE, POLYMER-IM-

Bureau of Reclamation, Denver, Colo. Engineering and Research Center. W. C. Cowan, and H. C. Riffle.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-238 083, \$4.50 in paper copy, \$2.25 in microfiche. Report REC-ERC-74-14, September 1974, 48 p. 25 fig. 27

Descriptors: *Concrete pipes, *Mechanical properties, *Concrete testing, *Polymers, Compressive strength, Tensile strength, Shear strength, Laboratory tests, On-site investigations, Precast concrete, Hydrostatic pressure, Concrete technology, Reinforcement, Drains, Sewers, Culverts, Pipes, Absorption, Durability, Reinforced

Identifiers: *Polymer concretes, Loading tests, Pipe tests, Steel fiber reinforced concrete.

The evaluation of structural and durability proper-The evaluation of structural and durability properties of polymer-impregnated concrete (PIC) pipe as compared with those of commercially manufactured concrete pipe was presented in three separate studies: (1) 4-inch-diameter concrete draintile, (2) 12- and 24-inch-diameter concrete sewer and culvert pipe, and (3) 36-inch-diameter concrete culvert pipe. Impregnation and polymerization of concrete pipe resulted in significant improvement in strength and durability. Polymer impregnation of concrete pipe transitie increased the three-edge bearing strength from creased the three-edge bearing strength from about 70 to 280% above that of the untreated pipe. The three-edge bearing strength of 12- and 24-in unreinforced concrete sewer and culvert pipe was unreinforced concrete sewer and curvert pipe was increased from about 110 to 150% by polymer impregnation. Unreinforced 36-inch-diameter PIC pipe exceeded the ASTM: C 76 requirements for ultimate three-edge bearing load by 50 to 90%. Polymer-impregnated 36-inch-diameter concrete pipe subjected to 5% sulfuric acid showed increases in resistance to sulfuric acid attack of from 2.8 to 7.8 times that of the untreated concrete pipe. W76-01489

8G. Materials

SEWER IN FLOOD PLAIN MUST FIGHT INFIL-TRATION. For primary bibliographic entry see Field 5D.

W76-01048

INSERTION OF POLYETHYLENE PIPE RENEWS DAMAGED SEWER, Montgomery Water and Sanitary Sewer Board,

For primary bibliographic entry see Field 8A. W76-01050

PVC \PIPE CUTS COLORADO DISTRICT'S FLOW COST, North Table Mountain Water and Sanitation Dis-

B. Byrne. Water and Sewage Works, Vol 119, No 12, p 51, December, 1972. 2 fig.

Descriptors: *Plastic pipes, *Sewerage, Clay pipes, Colorado, Costs, Joints(Connections), Pipes.

Identifiers: Polyvinyl chloride, North Table
Mountain Water and Sanitation District.

Polyvinyl chloride (PVC) pipe has been used to meet tight specifications for the North Table Mountain Water and Sanitation District's sewer Mountain Water and Sanitation District's sewer system near Denver, Colorado. Replacing vitrified clay pipe specified for all sized below 10 inches, the PVC pipe, with a rubber ring joint seal, meets exacting specifications of 100 gallons per inch diameter per mile per day and should save the district considerable sewage treatment costs. 19,660 feet of 8-inch and 555 feet of 6-inch sizes of the touch resilient and high impact PVC size have tough, resilient, and high-impact PVC pipe have been installed. Installation of the lightweight, corrosion-resistant pipe was quick and easy especially in soil of a high water level area. (Sandoski-FIRL)

INVESTIGATIONS OF THE APAC WATER SEEPAGE BARRIER, Arizona Univ., Tucson. Dept. of Civil Engineering

and Engineering Mechanics. R. K. Frobel.

Master of Science Thesis, 1975. 67 p, 6 tab, 19 fig, 2 append, 20 ref.

Descriptors: *Sealants, *Leakage, *Linings, *Water storage, *Protective coatings, Reservoirs, Canals, Watersheds(Basins), Canal scepage, Seepage, Watertight, Reservoir leakage, Coatings, Impervious membranes, Soil sealants, Water-proofing, Canal linings, Water yield improvement. Identifiers: APAC method.

Three testing methods were utilized to evaluate the APAC (Asphalt-Plastic-Asphalt-Chip-Coated) method of lining canals, catchments, and reservoirs. The first method tested hydrostatic puncture resistance; the second determined slope stability; and the third tested the overlap seal strength of three available adhesives. In all three tests APAC met the desired standards for providing secure water storage and transportation.
(McLachlan-Arizona) W76-01115

THE HYDRAULIC CHARACTERISTICS OF PLASTIC LAND DRAINAGE PIPE, Ministry of Agriculture, Fisheries and Food, Cam-bridge (England). Field Drainage Experimental

Unit.

C. W. Dennis. Proceedings of the Institution of Civil Engineers, Vol 55, Part 2, p 273-284, March, 1973. 11 fig, 2 tab, 17 ref.

Descriptors: *Plastic pipes, *Surface drainage, *Hydraulic design, Clay pipes, Laboratory tests, Construction materials. Identifiers: United Kingdom.

Land drainage in the United Kingdom is conven-Land drainage in the United Kingdom is conventionally carried out using short lengths of clayware pipe, water entry to the system being via the gap between individual pipes. Since 1965 plastic drain pipes, of both smooth and corrugated construction, have been gradually introduced, in which the water enters through holes or perforations in the pipe wall. Hydraulic design data for the new product was lacking because of the unusual types of roughness involved. Laboratory tests were carried out and plotted in the conventional form of ried out and plotted in the conventional form of friction factor against Reynold's number. These graphs give information on flow in the laminar region and on the different types of changes to gion and on the different types of changes to transitional flow which may occur. More practi-cally, the tests show that the pipes currently available can be divided into three broad catego-

Field 8-ENGINEERING WORKS

Group 8G-Materials

ries based on the type of roughnes,. (Sandoski-FIRL) W76-01290

STEEL SELECTED FOR TIGHT EFFLUENT LINE.

LINE, Warren and Van Praag, Inc., Decatur, Ill.

Warren and values, A. A. Bensley.
Public Works, Vol 106, No 9, p 96-97, September, 1975. 3 fig.

Descriptors: *Activated sludge, *Construction materials, *Pipelines, *Steel pipes, Sewers, Effuents, Joints(Connections), Installation, Illinois. Identifiers: Decatur(III).

For the connection of a proposed activated sludge treatment stage of the Decatur, Illinois, Sanitary District to aerated lagoons, an effluent pipelines of the best appropriate material had to be chosen. Specifications for the effluent conduit included: a requirement for large size (36, 48, and 72 inches in diameter) conduit to meet limited head loss conditions; internal pressure of one to two pounds per square inch; pipes to be laid in shallow excavations, then covered by earthen embankments to a depth of 3 to 4 feet; and service roadways at given locations. While reinforced concrete pipe was the initial choice for the line. Armco Welded-Seam Helcor Smooth-Flow sewer pipe was found to be a suitable and less costly alternative. The basic material is corrugated steel, zinc coated, and the coils of corrugated steel are helically wound to form round pipe of a consistent diameter. The pipe has an asphalt covered exterior; the interior corrugations are also asphalt covered to a one-eighth inch depth. A combination of bolted connecting bands and rubber O-ring gaskets called Hugger joints, are used to link abutting lengths. Tightness of the joints was field tested, ane air pressure held to within the required limits. Pipe installation operations involved several 20-foot lengths to be laid and bedded, followed by air pressure testing of their individual joints. (Kramer-FIRL) W76-01459

SEWER INSERTION RENEWAL SAVES TOWN \$2.5 MILLION.

R. Doan, Jr., and M. T. Broderick. Public Works, Vol 106, No 9, p 72-74, September, 1975, 3 fig.

Descriptors: *Sewerage, *Repairing, *Plastic pipes, Sewers, Costs, Conveyance structures, Pipelines, Construction, Maintenance, Joints(Connection), New York. Identifiers: Sewer pipe insertion, *Polyethylene pipes, Amherst(NY).

Amherst, New York, saved \$2.5 million or almost 80% of the cost of conventional swer renewal by inserting polyethylene pipe into their deteriorating collector. Thirty-six inch (OD) Series 80 'Aldyl' D polyethylene pipe was pulled through 48-in (ID) tile block collector. Application of the Manning flow formula proved that the smooth interior of the 32-in polyethylene pipe would offer little resistance to the flow. This reduced resistance to flow in the inserted pipe maintained the original flow capacity. Specifications for the insertion process included: descriptions for unloading and storing 90, 39-ft lengths of polyethylene pipe: construction of three inch shafts and two entry shafts; butt fusion of the polyethylene pipe; clearing the old pipe prior to insertion; the actual steps of the insertion; details of mechanical connections; directions for tapping the polyethylene pipe at the line's three manholes; provisions for assurance of flow in the parallel 8-in sanitary line; procedures and materials for grouting; and procedures and materials for laying concrete protection over mechanical connections. Each of these specifications is discussed. The process renewed 3400 feet of the sanitary collector, possibly the biggest sewer insertion renewal project ever attempted by a municipality. The success of the project

prompted Amherst to commit municipal labor to massive insertion renewal of sewers throughout the town. (Orr-FIRL) W76-0146

LONGEVITY OF SEWER GROUT UNDER SEVERE CONDITIONS, Hollywood Utilities Dept., Fla.

T. P. Calhoun.
Public Works, Vol 106, No 10, p 80, October, 1975.

Descriptors: *Construction materials, *Analytical techniques, *Sewer systems, Joints(Connections), Pipelines, *Grouting. Identifiers: Acrylamide.

The performance of an acrylamide-based grout for the repair of sewer joints, which has been used since 1960, was evaluated in Hollywood, Florida. Because the area is involved in large amounts of sewer maintenance and rehabilitation, it was felt important that a grouted joint that had been exposed to severe conditions for several years be examined for deterioration. An 8-inch transverse main that had been grouted six years previous to examination was chosen. The joint was located in a section where sandy soil is periodically subjected to salt water intrusion, fresh water flooding, and prolonged dry spells. The line carries both domestic sewage and industrial waste. Visual inspection of the gel showed no signs of physical deterioration. While the soil was above the water table, no signs of grout desiccation were found. The gel ring was cut and the inside showed a solid matrix of sand and gel all the way through the pipe. Samples of gel were sent to be inspected in a laboratory that manufacture acrylamide-based grout. No indications of shrinkage or chemical degradation could be measured. Thus, the grouted joints appear to have a very long-term life expectancy and appropriations for further grouting have been approved. (Kramer-FIRL)

8H. Rapid Excavation

HOW TORONTO IS INSTALLING SEWERS WITHOUT DISTRUPTING TRAFFIC FLOW, For primary bibliographic entry see Field 5D. W76-01051

PRINCIPLES OF DIMENSIONING THE SUP-PORTING SYSTEM FOR THE 'NEW AUSTRI-AN TUNNELLING METHOD', For primary bibliographic entry see Field 8E. W76-01281

81. Fisheries Engineering

AN EXPERIMENT IN THE MIXED CULTURE OF CHANNEL CATFISH AND LARGEMOUTH BASS

D. H. Buck, R. J. Baur, and C. R. Rose.
Prog Fish-Cult. Vol 35, No 1, p 19-21. 1973. Illus.

Descriptors: *Bass, *Channel Catfish, Fish Management.

Consideration is given to the practicability for the combined culture of largemouth bass (Micropterus salmoides) and channel catfish (Ictalurus punctatus) in subadult sizes. Bass trained to accept peleted food were stocked both alone and in combination with channel catfish in outdoor, unshaded, 10-foot-diameter plastic pools having soil substrates. Over a 70-day feeding period the catfish made the better gains, but the 2 species appeared to be completely compatible with neither limiting the production of the other.—Copyright (c) 1973, Biological Abstracts, Inc.

A REPORT ON THE ARTIFICIAL FERTILIZA-TION OF THE SMALLMOUTH YELLOWFISH, BARBUS HOLUBI (STEINDACHNER, 1894), Provincial Fish Inst., Lydenburg (South Africa). Transvaal Nature Conservancy Div. P. F. S. Mulder, and G. W. Franke. J Fish Biol. Vol 5, No 2, p 143-145, 1973.

Descriptors: *Fertilization, Incubation, Mortality. Identifiers: Barbus Holubi, Yellowfish.

Artificial fertilization was successfully applied in the culture of B. holubi. By this method the fertilization potential was raised considerably and the mortality rate under normal conditions during the incubation period was less than 5%. The handling and transferring of larvae to fertilized rearing ponds was simplified and an estimation of the seasonal production could be made without waiting for the fish to attain the fingerling stage. Normal breeding activities were not disturbed by frequent handling and natural breeding took place in ponds where the fish were kept.—Copyright 1973, Biological Abstracts, Inc. W76-01021

TOTAL ALKALINITY AND HARDNESS OF SURFACE WATERS IN ALABAMA AND MIS-SISSIPPI,

Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures. For primary bibliographic entry see Field 2K.

For primary bibliographic entry see Field 2K. W76-01144

THE EFFECT OF DURATION OF FEEDING, AMOUNT OF FOOD, LIGHT INTENSITY, AND ANIMAL SIZE ON RATE OF INGESTION OF PELLETED FOOD BY JUVENILE PENAEID SHRIMP.

SHRIMP, Skidaway Inst. of Oceanography, Savannah, Ga. L. V. Sick, D. White, and G. Baptist. Prog Fish-Cult Vol35, No 1, p 22-26. 1973 Illus.

Descriptors: *Shrimp, Fish diets, Fish physiology.

Rates of pelleted formula diet ingestion (mg food ingested/g animal dry weight/hr) were determined for different size juvenile shrimp (Penaeus setiferus) (2-4 g, 5-7 g, and 15-20 g) fed at 10, 20 and 30% of their total biomass, for feeding periods of 6, 12 and 24 hr and under light intensities of 1.6, 250 and 1100 ft-c. These interactions, tested using two 3 x 3 x 3 factorially designed randomized complete block experiments, revealed that the highest average rate of ingestion (5.9) occurred among animals fed 10% of their total biomass under 1100 ft-c of light and exposed to the same food for only 6 hr. Comparing animal size, light intensity, and period of exposure to the same food revealed that rates of ingestion increased with increases in light intensity, decreased with animal size (on a unit weight basis), and decreased with an increase in period of exposure to the same food. In a 2nd experiment comparing animal size, light intensity, and amount of food, rates of food ingestion for differences in animal size and light intensity were the same as in experiment 1. Ingestion rates did not change with increases in amounts of food fed above 10% of total biomass .-- Copyright 1973, Biological Abstracts, Inc. W76-01154

GEOGRAPHY AND LAKE MORPHOMETRY OF THE AQUACULTURE STUDY AREAIN THE ERICKSON-ELPHINSTONE DISTRICT OF SOUTHWESTERN MANITOBA,

Fisheries and Marine Service, Ottawa (Ontario). For primary bibliographic entry see Field 2H. W76-01166

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. XII.

NUMBERS AND BIOMASS OF THE FAUNA AS-SOCIATED WITH MACROPHYTES, Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology. For primary bibliographic entry see Field 2H. W76-01174

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ICHTHYOPHTHIRIASIS IN THE MIRROR CARP: II. LEUKOCYTE RESPONSE, Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station.
R. S. Hines, and D. T. Spira.
J Fish Biol, Vol 5, No 4, p 527-524, 1973. Illus.

Descriptors: *Carp, *Fish diseases.
Identifiers: Ichthyophthiriasis, Ichthyophthirius multifilis.

Changes in leukocyte counts in mirror carp infected with Ichthyophthirius multifiliis were recorded during the disease. Leukocytes were classified according to their appearance and stage of development. The overall white blood cell count in infected carp remained within the range found in normal carp under similar conditions. The 1st recognizable event in leukocyte dynamics was a sharp but temporary drop in lymphocytes with a concurrent rise in neutrophil percentages early in the infection. A similar trend also appeared towards the end of the infection. A significant shift towards younger cell populations was evident among the neutrophils. Blast cells with morphological characteristics of neutrophils appear in the circulation. The percentage of these cells and of other blast cells rose progressively during the infection. The number of cells termed fine reticular cells, also rose during infection. White blood cell changes in the Nirror carp infected with I. multifiliis were similar to changes observed for other diseases and also in response to certain stress conditions.—Copyright 1974, Biological Abstracts, Inc.

10. SCIENTIFIC AND TECHNICAL INFORMATION

10D. Specialized Information Center Services

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS: JULY 1971 - JUNE 1972, D. A. Sandoski. Environmental Protection Technology Series EPA-R2-72-127, December, 1972. 97 p, 215 ref.

Descriptors: *Abstracts, *Urban runoff, *Storm runoff, Sewers, Design criteria, Construction materials, Infiltration, Water pollution, Water quality, Legislation, Tunnels. Identifiers: Treatment methods.

This compilation of abstracts summarizes articles from a variety of technical literature and conferences, both domestic and foreign and published from July 1971 through June 1972, primarily related to the problems of urban runoff caused by storm water discharges, combined sewer overflows, and nonsewered urban runoff. All aspects related to this topic fall under the selective areas of: design criteria and construction materials for sewers or apparatus employed in the flow of combined sewage and/or storm runoff; regulation devices for overflow or infiltration from urban runoff of storm water, combined sewage, or highway-salt runoff which can cause water pollution; water quality, legislation, or treatment methods based on problems caused from storm water; and, current tunnel technology and equipment used in the construction of sewer tunnels. The 215 abstracts covering a range of ten sections are arranged numerically by abstract accession number within each category. Each item includes a bibliographic citation, an abstract, and a set of in-

dexing descriptors and identifiers. A subject index appended in this issue provides the necessary access to individual concepts. An author index and a glossary for journal abbreviations are also included. (Sandoski-FIRL) (See also W71-06253-W71-06255)
W71-06255)

10F. Preparation Of Reviews

AGRICULTURAL WASTES, (LITERATURE REVIEW), Mississippi State Univ., State College. For primary bibliographic entry see Field 05D. W76-01390

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W76-01347 W76-01348	6B 6G		W76-01426 W76-01427	2A 5D	
W76-01349	6B		W76-01428	2E	
W76-01350	6B		W76-01429	5D	
W76-01351	5G		W76-01430	5E	
W76-01352	5G	100	W76-01431	5D	
W76-01353 W76-01354	5G 4A	1	W76-01432 W76-01433	5D 5D	14
W76-01355	6D		W76-01434	5D	
W76-01356	6B		W76-01435	5D	
W76-01357	6B	100	W76-01436	5D	
W76-01358	6E		W76-01437	5D	
W76-01359 W76-01360	6B 6B		W76-01438 W76-01439	5F 5D	
W76-01361	4A		W76-01440	5D	
W76-01362	4A		W76-01441	5D	
W76-01363	4A		W76-01442	5D	
W76-01364	4A		W76-01443	5A	
W76-01365 W76-01366	4A 3D		W76-01444	5D	
W76-01367	4A		W76-01445 W76-01446	5A 5D	
W76-01368	4.4		W76-01447	4A	
W76-01369	4A		W76-01448	5D	
W76-01370	4A		W76-01449	5D	
W76-01371 W76-01372	4A 4A		W76-01450 W76-01451	5D 5D	
W76-01373	4A		W76-01452	5D	
W76-01374	4A		W76-01453	5F	
W76-01375	5G		W76-01454	4A	
W76-01376	5D		W76-01455	5D	
W76-01377 W76-01378	5B 5D		W76-01456 W76-01457	5D 5D	
W76-01379	5D		W76-01457	5D	
W76-01380	5D		W76-01459	8G	
W76-01381	5 B		W76-01460	8C	
W76-01382	5D		W76-01461	8G	, 437
W76-01383	5B	00-97-0	W76-01462	8G	
W76-01384 W76-01385	5B 5G	1 1 1 W	W76-01463 W76-01464	5D 5D	
W76-01386	5D	10 A	W76-01465	5D	
W76-01387	5B		W76-01466	5D	
W76-01388	5G		W76-01467	8C	
W76-01389	5G		W76-01468	5D	
W76-01390 W76-01391	5D 6E		W76-01469 W76-01470	2J 8B	
4 10-01391	OL		# /U-UI-4/U	o D	

W76-01471 4D W76-01472 2B W76-01473 2D W76-01474 2D W76-01475 2H W76-01476 W76-01477 2H W76-01478 2B W76-01479 2B W76-01480 2G W76-01481 2L W76-01482 2E W76-01483 2E W76-01484 21. W76-01485 2C 2C W76-01486 W76-01487 2C 8A W76-01488 W76-01489 8F W76-01490 8A W76-01491 2L W76-01492 2C 2B W76-01493 2J W76-01494 W76-01495 4A 2L W76-01496 W76-01497 5B W76-01498 2L W76-01499 2L W76-01500 5B

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ABSTRACT SOURCES

SOU	RCE	ACCESSION NUMBER	TOTAL	
Α.	CENTERS OF COMPETENCE			
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	Cornell University, Policy Models for Water Resources Systems	W76-0100101015 0132801342	30	
	East Central Oklahoma State University, Agricultural Livestock Wastes	W76-0101701046 0108801096 0137501390	55	
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	University of Wisconsin, Eutrophication	W76-0113901153 0115501160 0116201175	35	
В.	STATE WATER RESOURCES . RESEARCH INSTITUTES	NONE		

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